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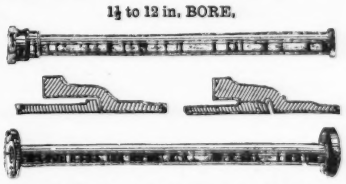

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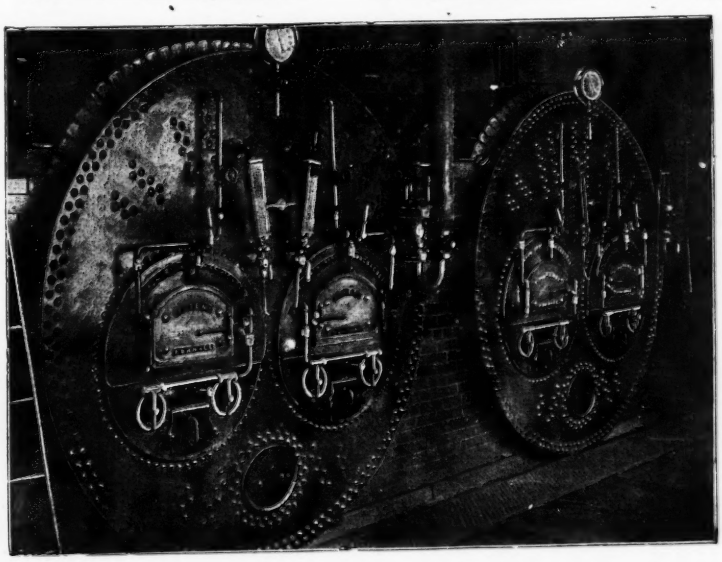

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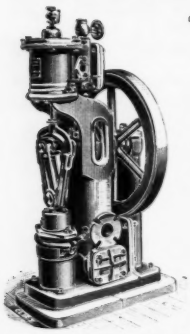

Fig. 705. "SINGLE RAM" STEAM-PUMP.

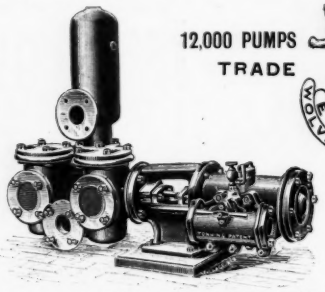

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

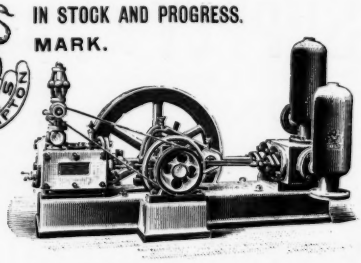

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

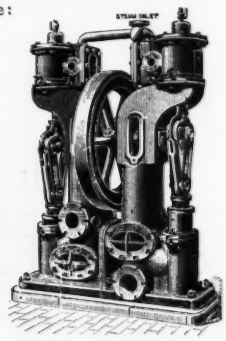

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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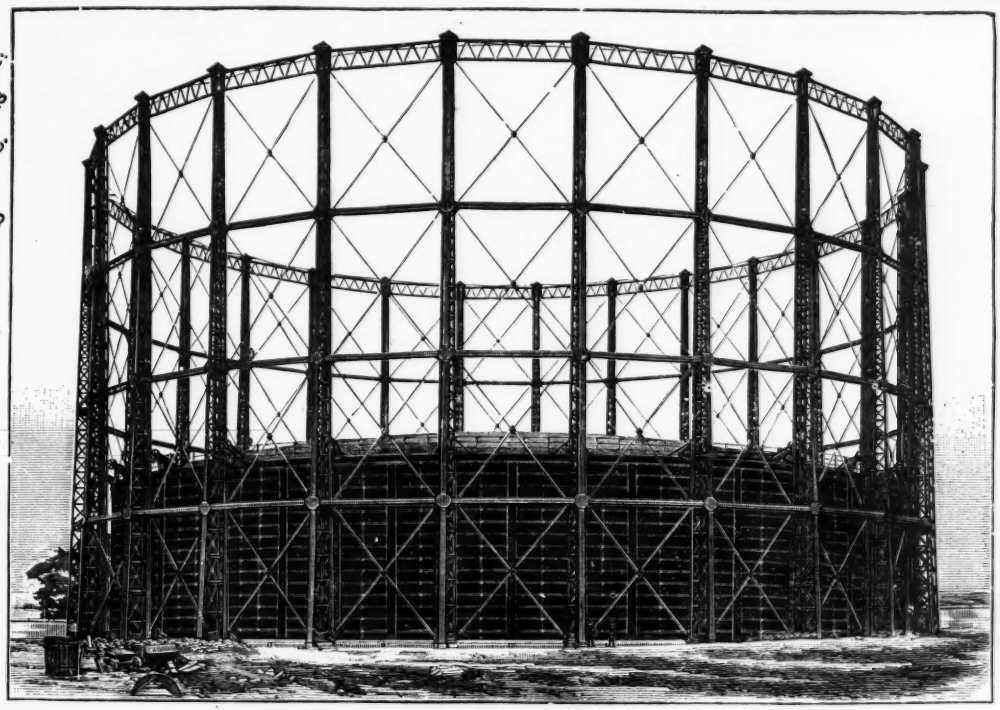

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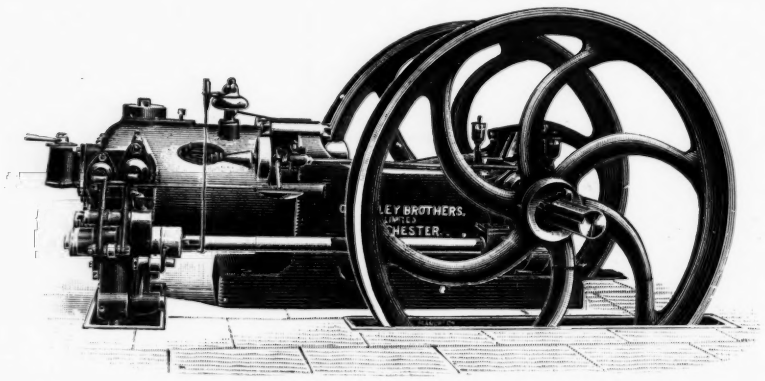

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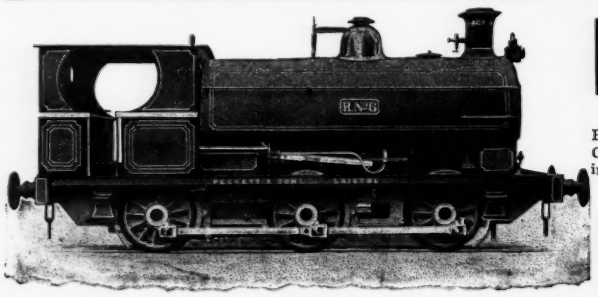

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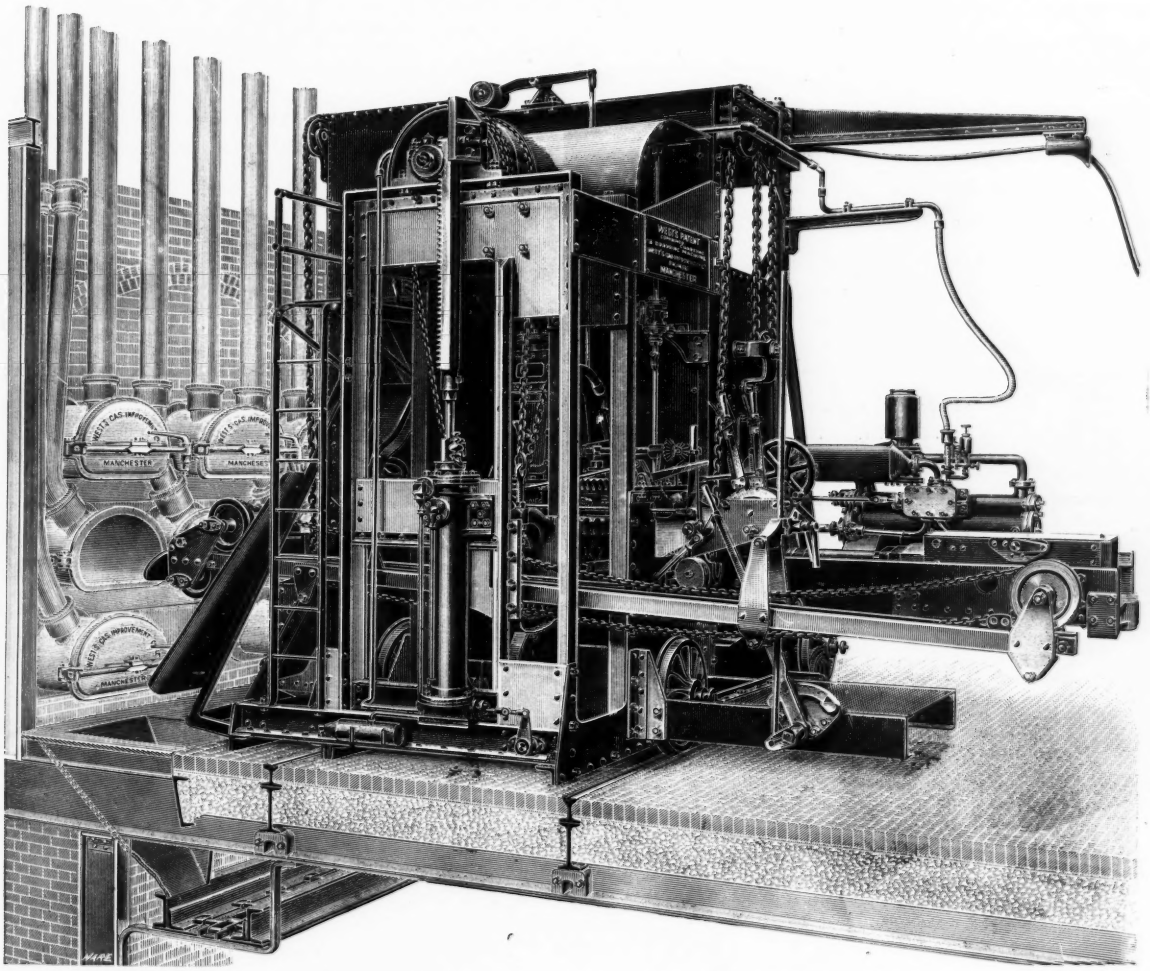

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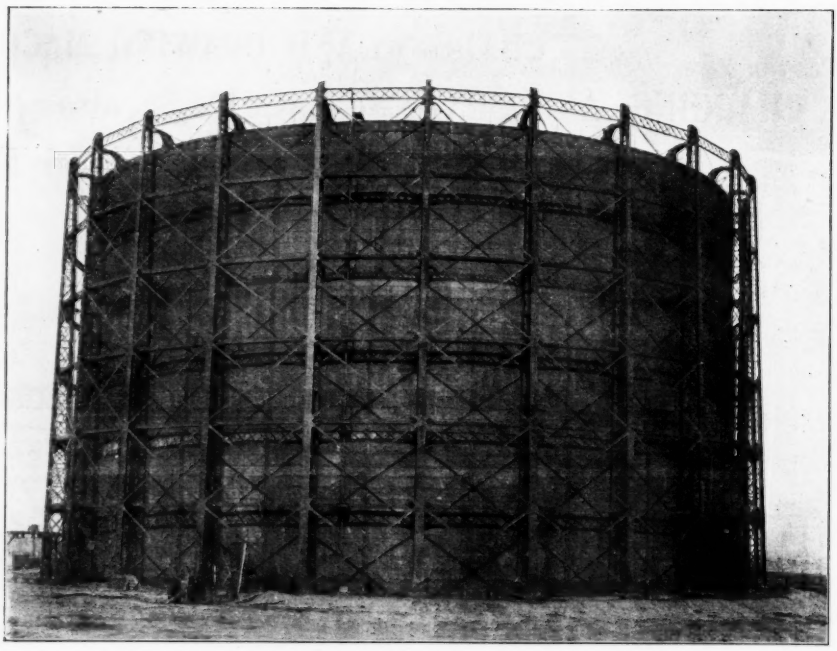

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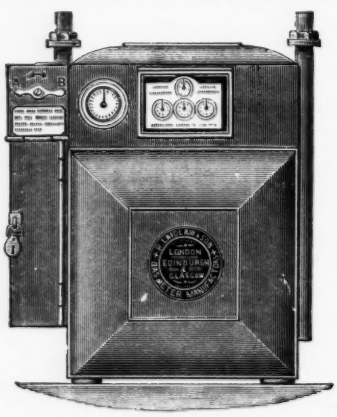

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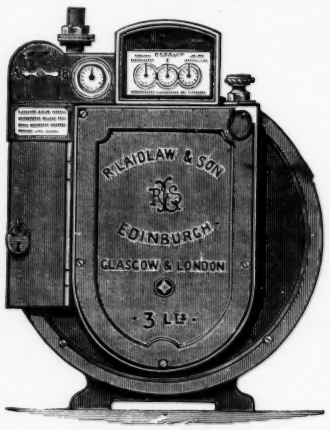

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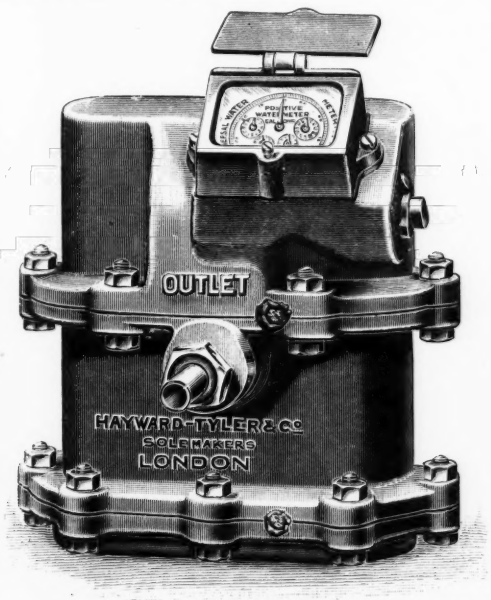

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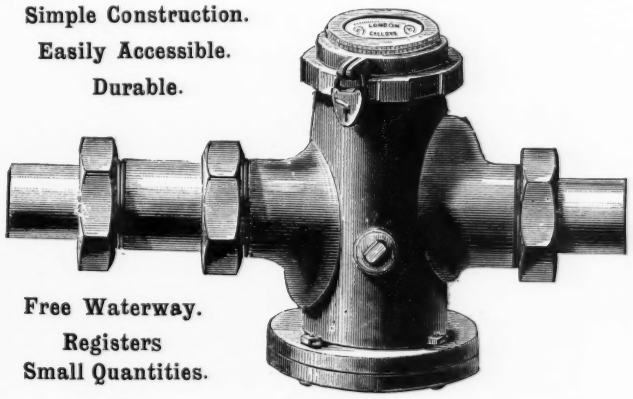

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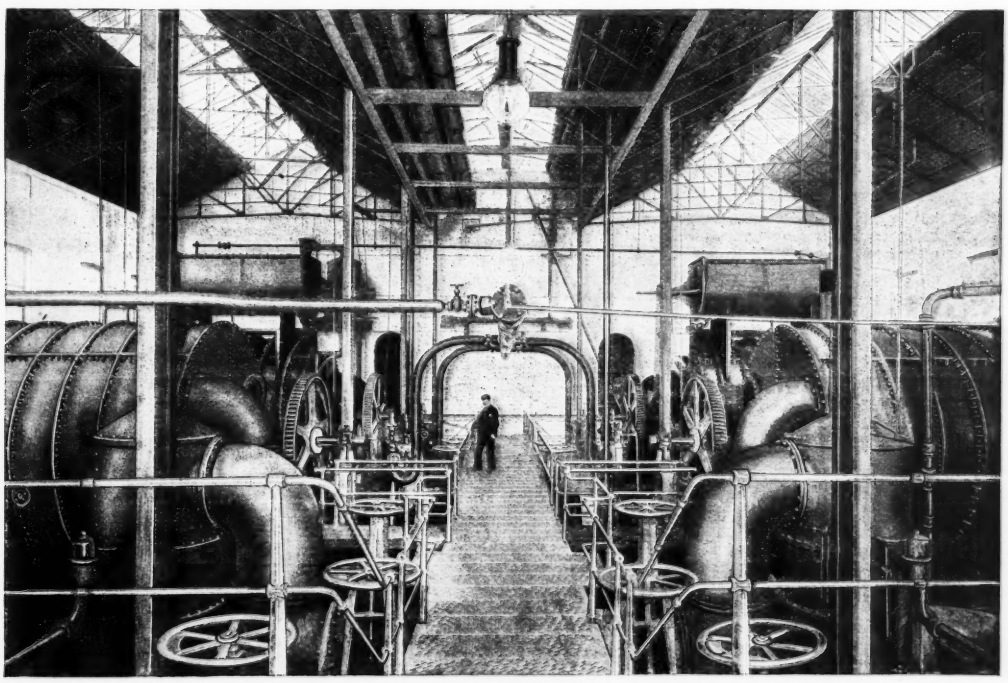

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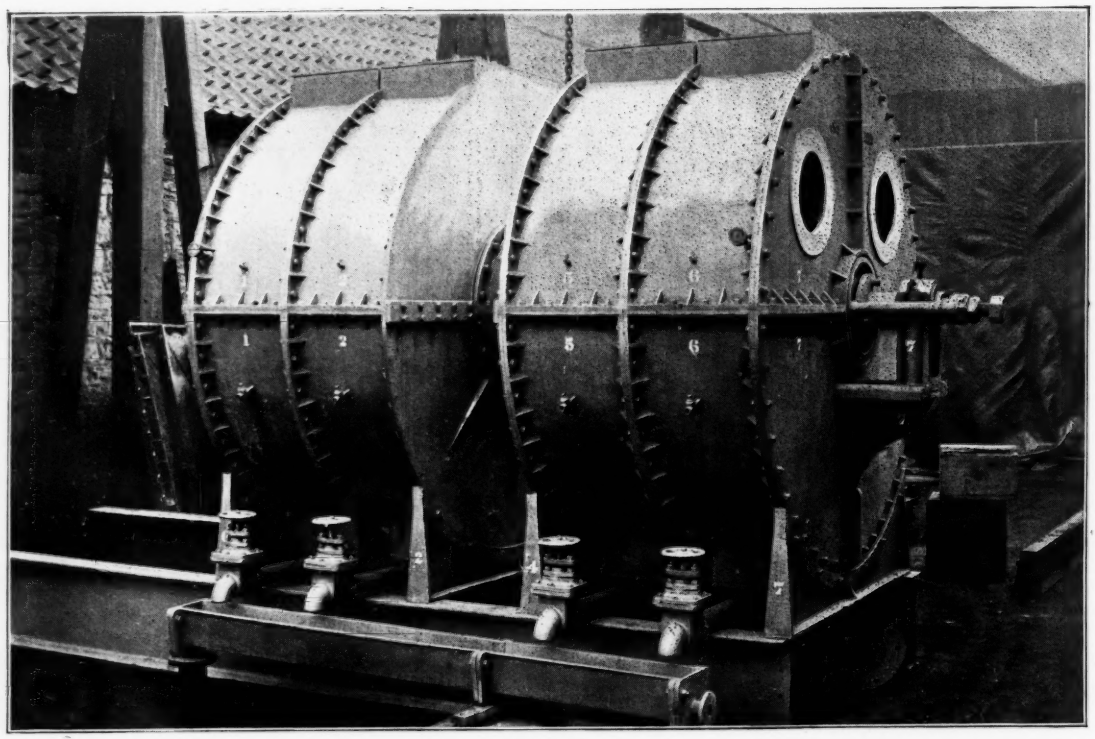

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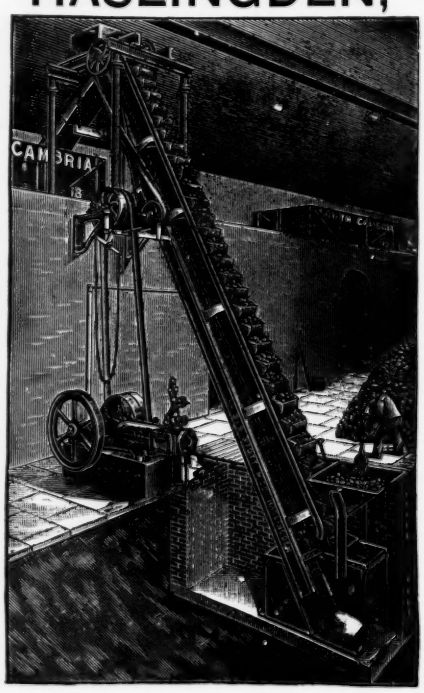

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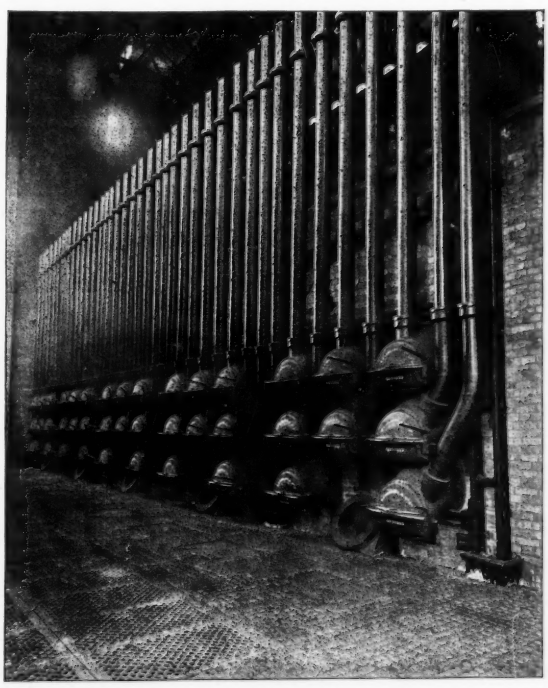

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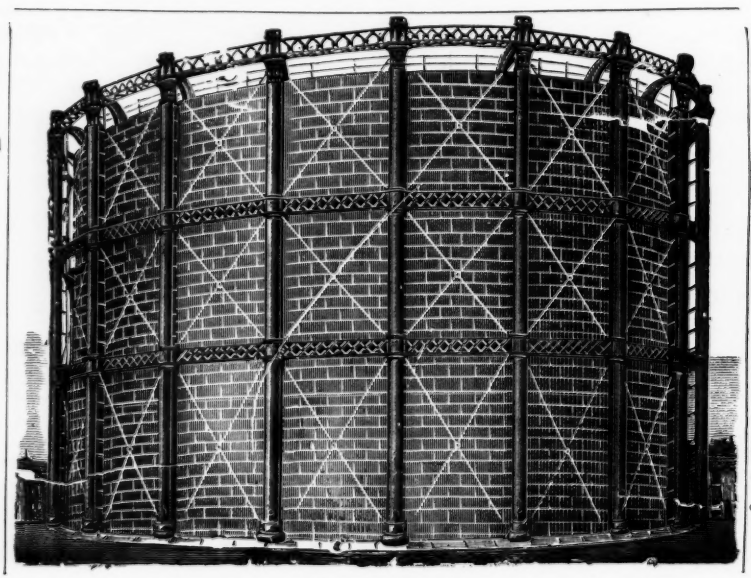

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CONTENTS.

EDITORIAL NOTES.

GAS, LIGHTING, &c.—
The Affairs of the Gaslight and Coke Company 285
The South Metropolitan Report and Accounts 286
The Amendment of the Borough Funds Act 286
Alterations of Private Bill Procedure . 286
The Meeting of the North British Association 287
Gas-Engines for Water-Pumping . . . 287
Birmingham Gas Policy—The Beanfeast Nuisance—The Christmas-Box Tax—And the Cheap Information Dodge—The Higher Aims of Municipalities—The New Trade Union Policy—The Settle-Padfield Carbonizing Process. 288

WATER AFFAIRS—
A London Water Company Rebuked . . 290
The Water Riots in Trinidad. 290

ESSAYS AND REVIEWS.

Gas and Water Stock Market 291
Lord Avebury on Municipal Trading . . . 291
The Exclusion of Gas from Municipal Housing at Battersea 292
Electric Lighting Memoranda 293

COMMUNICATED ARTICLE.

The Purification of Gas from Sulphur. By H. Leicester Greville, F.I.C., F.C.S. . . 294

REGISTER OF PATENTS.

Incandescent Gas-Lamp Fittings—Podmore, A. E., and Thomas, J. 310
Retort Mouthpieces—Chandler, S. & J. . . 310
Apparatus for Treating Gases with Liquids for Purifying Gases, and for other Purposes Boult, A. J. (La Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz). 310
Patent Notices 311

TECHNICAL RECORD.

North British Association of Gas Managers—Annual Meeting at Ayr—
General Business 295
Inaugural Address of Mr. T. Lighbody, of Renfrew 296
Mr. W. Young on the Principles Involved in the Production of Gases from Coal, and Suggestions as to their Application in Future Developments 298
Mr. A. Waddell on the Coal and Coke Handling Plant at Dunfermline . . . 303
Western (U.S.A.) Gas Association—Annual Meeting at Louisville 305
British Association of Water-Works Engineers—Annual General Meeting at Bolton—
Mr. D. H. Irwin on the Internal Combustion Engine as a Pumping Medium . 307
Mr. C. Clemesha Smith on a New Pipe-Scraper 309
An American Gas-Engine Pumping-Station . 309

CORRESPONDENCE.

Monazite 312

PARLIAMENTARY INTELLIGENCE.

House of Lords—Rejection of the Beckenham Clause; Progress of Bills 312
House of Commons—Amendment of Standing Orders Relating to Private Business; Progress of Bills 312
House of Commons Committee—North-Western Electricity and Power Gas Bill . 313

LEGAL INTELLIGENCE.

High Court of Justice—King's Bench Division Ilford Urban District Council *v.* Jackson . 313
Thames Police Court—Cutting Off a Supply of Water 314
Nuisance at the Holyhead Gas-Works. . . 315
The Assessment for Water-Rate of Tenement Houses 315

MISCELLANEOUS NEWS.

Gaslight and Coke Company—Half-Yearly Report and Accounts 315
South Metropolitan Gas Company—Half-Yearly Report and Accounts 317
Brentford Gas Company—Half-Yearly Report and Accounts 318
Street Lighting in Westminster. 318
Edinburgh Public Lighting—Report by Mr. Herring 318
Gas Testing in West Ham—The Test-Burner Question 319
Cheaper Gas for Birmingham—The Committee's Recommendations Adopted . . 320
Broughty Ferry Corporation Gas-Works—Mr. Waddell's Defence 322
Salford Corporation Gas Supply—The Past Year's Working 323
The Dublin Electric Lighting Scheme . . 323
Dewsbury Corporation Gas and Water Supply—The Annual Accounts 324
Chelmsford Water Supply—Local Government Board Inquiry 324
Notes from Scotland 325
Current Sales of Gas Products 326
Coal Trade Reports 326

PARAGRAPHS.

Personal. 293
An American Catalogue of Fuel-Gas Appliances—Incandescent Gas for Railway Carriage Lighting in France—Irish Association of Gas Managers 293
Suffocation of a Gas Stoker—Reductions in Price 310
Improved Lighting for Whitehall—Ilkeston Gas Supply 311
Gas Explosion in an Electric Lamp—Effect of Heavy Rainfall upon Deep Wells . . 312
Unprofitable Water-Works at Wolverhampton 316
Public Lighting at West Bromwich . . . 319
The Quality of Stockport Water—Street Watering Stopped in Constantinople—The Flow of the Thames at Teddington . 327

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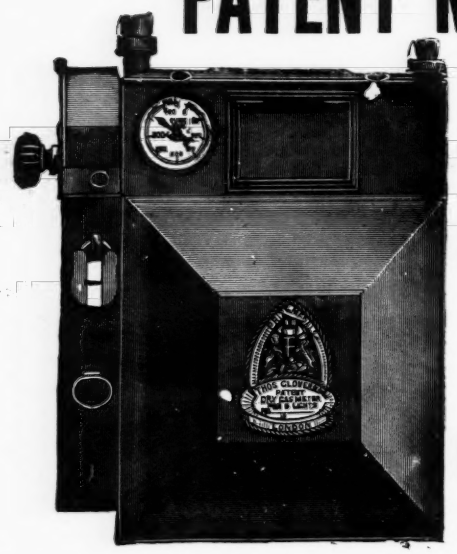

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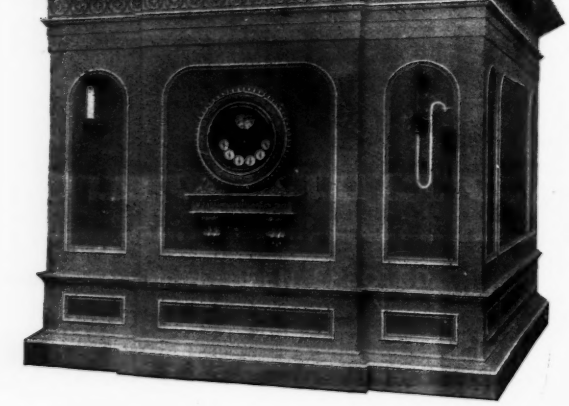

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EDITORIAL NOTES.

The Affairs of the Gaslight and Coke Company.

THE report of the Directors and the statement of accounts relating to the working of the Gaslight and Coke Company for the past half year are in the hands of proprietors, and will be considered at the general meeting to be held on Friday. As usual, the announcement of the dividend has already been made—showing that the Directors are in a position to recommend a distribution after the rate of £4 8s. per cent. per annum upon the ordinary stock, and carrying forward £116,530. The rate of dividend paid for the corresponding half of 1902 was £4 per cent. per annum, with a carry forward of £68,165. On the face of the statement, therefore, the financial position of the Company has considerably improved; and proprietors and the public are to be congratulated on the fact. Notwithstanding the improvement, however, the market price of the Company's stock obstinately remains low; and one would like to know why, and what justification there is for the operative reason. The explanation probably is that the market for all good stocks is at present abnormally weak, as shown by the disfavour into which the once highly-prized municipal stocks have fallen. When English Corporations are no longer able to borrow money at the rates of interest which they have been accustomed to pay, Gas Companies must to some extent participate in the movement. At the same time, however, it must be admitted that the dividend announcement of the Gaslight and Coke Company has had a good effect on the market; and if the Directors had only given more attention to the strengthening of the reserves in the past, instead of sharing out so much, the public would now have more confidence in their finance. As it is, the existence of a big undivided balance has not the weight that it should possess. The accounts of the Company through a long series of years have exhibited many such fluctuations; and the confirmed policy of the Directors has been to empty the till as fast as it was filled. The proprietors have had the money while it was going; but this does not stop them from wishing there was more behind. The feeling is perhaps a little illogical; but it is not unreasonable.

The Company's financial system is about to be reconstructed, in conformity with the Act of the present session. The situation is unprecedented; and while the proprietors may be pardoned for feeling a little sore about it, they are well advised in the report to be thankful for what they have left. It is true that, in order to obtain power to create and issue £750,000 of debenture stock—that is to say, to pledge their property to this relatively small additional amount—the proprietors have been required to submit to a large nominal reduction of standard price, and further to go without so much of any divisible profits as will be required to write off £1,000,000 of the dead capital. This is one way of looking at the new settlement. Obviously, all sorts of comments might be made upon this arrangement which would be of the nature of mourning over spilt milk, and therefore a wasted labour. It is much better to think of the future. With the report, there is issued a table showing at a glance the effect of the new sliding-scale, with redemption, as compared with the old one. This is not, after all, a very dreadful matter. For although the Company have been required to relinquish an initial price of 3s. 9d. per 1000 cubic feet and take 3s. 4d. instead, as a matter of fact and of practice they could never have gone to the former as the selling price of gas. As it stood, the extravagantly high initial was only a temptation and a licence to the greedy dividend-grabber (which was not always resisted as it ought to have been by the Board) to distribute a greater share of the profits than was prudent. In exchanging it for 3s. 4d., the Company actually secured a standard price 4d. higher than their selling price for the time being; which was confessedly a dear-coal price, offering good promise of falling rather than rising. This is to say, that the Company, with a "past" which, fairly or unfairly, was not regarded as wholly to their credit, were granted a standard price more liberal, in effect, than any maximum-price Company going to Parliament for the sliding-scale has nowadays the least hope of obtaining without the countervailing condition of a "neutral zone." The proprietors have every reason to be grateful to the advisers of the Board in their parliamentary campaign, who were instrumental in bringing off this agreement with the adversaries of the Company.

The Directors are wise in putting the new dividend at the same rate—£4 8s. per cent. per annum—as will be payable after the beginning of next year, when the new conditions will come into force. At the selling price for gas (3s. per 1000 cubic feet), the authorized rate of dividend on the existing scale is £4 18s. per cent. per annum. They would not dare to recommend anything like it, in the circumstances of the undertaking. They will have another half year in which to make further proof of their prudence; and then will begin the new order, with an authorized rate of dividend of £4 10s. 8d. for gas at the same selling price, 2s. 8d. of which must go to form the new redemption fund. This fund is nothing more than a formal way of doing what the Company should have done out of revenue during the past 25 years. They have enjoyed the feast, and must now pay the reckoning.

The gravest admission of the report, after the financial statement, is with regard to the continued shrinkage of the Company's business. The quantity of gas sold was 4 per cent. less than the sale in the corresponding half of 1902. This is a very serious matter, not to be disposed of by the hackneyed excuse of the prevalence of "abnormally mild "and light weather" in the month of February. We had plenty of cold and dull weather in May and early June to make up for this imputed geniality of a late winter, which is scarcely borne out by individual remembrance. At last the Directors are fain to seek some further excuse for the badness of trade; and so they descend upon the incandescent burner, which, they observe, "tends to check, temporarily, "the consumption of gas." Having said so much, it would have been well to carry the subject a little farther, by explaining what the Board are doing to make a friend of this economical method of using gas for public and private lighting. As the passage stands, it suggests that the incandescent burner is inimical to the proper business of the Company, whereas the truth is that, if it hits them rather hard for the time being, it is positively murderous to their real foes, the electric lighting people. Why not own up at once that the Gaslight and Coke Company, owing to their peculiar situation, are more susceptible than any other gas company in the country to the inroads of electric light competition, some of it rate-aided?

The improved aspect of the revenue account is, therefore, entirely due to savings, not to expansion of trade. This is satisfactory, so far as it goes. There has been retrenchment all round. The expenditure charged to capital for new buildings and machinery in extension of works has been cut down to the record figure of £5421. All the rest of the £57,510 entered under this heading is for the very satisfactory and comforting service of the distribution to fresh consumers. The large amount of £15,972 has been credited for depreciation of plant; which should be further explained. The economy in working expenses has already been mentioned. It ought to be a growing matter, as the price of coal is lower this year. Automatic meter supplies appear to be permanently knocked off. Rates and taxes, for a wonder, are positively less. A further payment of £5000 has been charged on account of the stamp duty on increase of nominal capital. Altogether, the profit balance shows an increase of from £504,923 to £580,494, notwithstanding the loss of gas-rental of £62,264. Residuals, as might be expected, have proved more profitable, the gain being nearly £17,000. From the high price of sulphate, the returns should even have been better. It can hardly be that the Directors are stocking again, after their experiences in this line. One notes with much satisfaction that the stove-rental continues to steadily mount. The outstanding automatic meter supplies fittings account has been reduced to £105,415.

Some detailed explanation ought to be forthcoming of the policy of the Board in this regard, which appears to have been very vacillating.

The report makes due acknowledgment of the feeling of the Directors in regard to the resignation of Mr. J. W. Field after 47 years' service; and the necessary information is furnished in respect to the steps which have been taken to deal with the situation created by his approaching retirement. Mention is also made of the appointment of the Board of Trade Committee on the gas-testing regulations applying to the Metropolitan Gas Companies. The proceedings at Friday's meeting can scarcely fail to be interesting, with so many important matters to engage the proprietors' attention; and it is to be hoped that the attendance will be in proportion to the gravity of the occasion.

The South Metropolitan Report and Accounts.

THE report of the Directors and the accounts of the South Metropolitan Gas Company for the past half year are given elsewhere; and they show generally that the flood-tide of prosperity in the Company's affairs does not slacken. Full sliding-scale dividends are to be paid, and a large addition has been made to the insurance fund. The total reserves standing to the credit of the undertaking now amount to close on £270,000, which makes the financial position of the Company exceptionally strong. It is rather remarkable that even now, after the consummation of a drastic stock-conversion scheme, it should be deemed expedient to explain that the present investor in the Company's stock does not receive so high a dividend as appears by the declaration. The truth is that the undertaking is getting once more into a plethoric state, and the feasibility of a reduction in price is again entering the scope of practical politics. It is to be sincerely hoped that the Board will not allow themselves to be drawn by their foes into abandoning their consistent rule of not making any reduction in price that is not likely to be maintained. It must be a great temptation to them to give the London County Council a counterstroke at almost any cost.

The persistent hostility of the London County Council to the Company is very properly placed upon record in the report of the Directors; and it constitutes the greatest bugbear in the path of the Administration. To exist under a continuous cloud of obloquy and suspicion is doubtless depressing to an almost intolerable degree; but in the case of the South Metropolitan Company and the Council there is apparently no help for it except in patient endurance. The present small fry of Spring Gardens are not immortal. As regards the effect of the new order of working on the consumers in the district, it is quite right and proper that the absurdity of the suggestion of a vastly increased consumption being necessitated by the supply of 14-candle instead of 16-candle gas should be exposed on every occasion. For many reasons, however, conclusions from contemporary data should not be too hastily drawn. It is probably safe to hold that a supply of unenriched gas is very suitable for consumers' general use. Farther than this one can hardly go for the present. The price paid for coal, for instance, does not indicate as yet that the Company have struck any fresh and appreciably cheaper source of raw material. What with the raising of the fiscal question, and some other considerations which it would be impossible to go into here, it does not seem very likely that the market price of gas coals will fall much lower, as a permanent thing.

The figures of the revenue account do not call for detailed criticism. The gas-rental has almost remained stationary, at £657,158, as compared with £653,424 for the corresponding half of 1902. It will take all the strength of the County Council opponents of cheap gas to get over this contradiction of their favourite line of computation, particularly in face of the evidence of the growing numbers of meters, stoves, and fires in use; which prove clearly enough that the fractional increase of consumption is owing to new business. Residuals have done better. On the other side of the account, coal has cost less; and there has been a still further saving of labour. The opportunity has been taken to keep up maintenance and renewals out of revenue. Distribution costs have risen; and it would not be surprising if this should prove an increasing expense for the next few years, as the enormous growth of South London must necessitate incessant rearrangements of the gas supply. The balance carried to the net revenue account increased from £195,168 to £224,788. The statement of coal carbonized is remarkable. The weight decreased from 584,084 tons to 561,017 tons, testifying to the progressive character of the working under the influence of the new dispensation.

The Amendment of the Borough Funds Act.

THE Borough Funds Act Amendment Bill seems to be in a fair way of passing through Parliament this session. It is drafted with unusual clearness, and seems to leave no room for misunderstanding on the part of any local authority in regard to the conditions under which the expenses of promoting Bills are to be chargeable under the Borough Funds Act, 1872. The amended procedure to be followed by the Council of a borough or urban district in the matter of promoting a Bill is detailed in a schedule, which certainly indicates a very much more reasonable way of ascertaining the bent of local opinion than the existing practice. At the statutory public meeting of "electors," which must be held in any case, the Bill is to be explained, either by the president or by a member or officer of the Council. The question of its promotion may be put either by single resolution in favour of the Bill as a whole, or by separate resolutions in respect to any part or clause. The decision of the meeting is to be final, unless a poll is demanded, which can only be by not less than 100 electors, or one-twentieth of the number of the electors, whichever may be the less, and in the event of the decision of the meeting being against the resolution of the Council. The Council may also demand a poll by resolution. Provision is made for withdrawing a demand for a poll. It would appear that all necessary protection of the public against the abuse by local authorities of their position and power to initiate Bills is conferred by this Bill, which also removes some difficulties that have been experienced in regard to the payment of expenses of unfortunate Bills. It removes the opposing of Bills from the operation of the fourth section of the principal Act—thus leaving this division of the parliamentary energies and responsibilities of local authorities on their own shoulders. On the whole, the Bill strikes one as being a sensibly drawn measure, fully in accordance with the most modern practices of local self-government in England. It does not extend to Scotland or Ireland.

Alterations of Private Bill Procedure.

RECENT experiences in respect to the vicissitudes of certain Gas Bills in Parliament were calculated to raise once more, in the minds of parties to, and spectators of, the proceedings, the old doubt as to the competence of Committees of Parliament to judge very important matters that must needs be submitted to this tribunal. Not to mention names or go into particulars, it must be obvious that there is a considerable degree of chance in the fortunes of Bills. It is impossible to forecast the quality and bent of a Committee of either House. The case that will appeal to one Committee may utterly fail to impress another. Before the first Committee, promoters may win "hands down;" only to discover that the following batch of noble lords, or honourable gentlemen, as the case may be, take a totally different view of the premises. One lesson at least stands out very conspicuously from the record of the session—that of the prime necessity for treating each House as a separate power, regardless of the other. Of course, this is understood as a general rule; but experience shows, over and over again, that the greatest adepts at parliamentary practice are apt to be betrayed into making light of the second investigation, to their clients' detriment.

The most valuable feature of Private Bill procedure is the right enjoyed by promoters of abandoning their programme at any stage short of the Royal Assent, and trying again another time. They are not bound by the judgment of the tribunal, as they would be in an action at law, but have always the liberty of taking or leaving it. This consideration suggests by inference that it is as well to go to Parliament, if possible, with a margin of time in hand. There are exceptions to the ruie, when Parliament will occasionally grant, in view of an emergency, powers that might in fairer circumstances have been withheld; but the general rule is the safer guide. There are so many stumbling-blocks in the way of procuring an entirely satisfactory decision. If the Committee is all that might be desired, the case may not be adequately put before them owing to the absence of

Counsel, or the failure of witnesses to say precisely the right word. For anyone knowing how many pitfalls there are in this line of country, it was quite amusing to note, the other day, that some wiseacre in the House ventured to propose that the national inquiry into the fiscal system of the country should be conducted by a Select Committee! There could hardly be a worse way of making such an investigation.

Speaking of Committee work, one is reminded of the circumstance that the House of Commons on Thursday last adopted a new set of Standing Orders relating to Private Bill business which will materially lighten and expedite the procedure. Full particulars of the changes made will be found in another column. Their nature has already been discussed in the "JOURNAL;" and it is therefore only necessary to remark here that the alterations appear to have commanded the unanimous assent of the House. One of the most important of the reforms deals with the question of *locus standi*, which the House of Commons has always resolved in a more restricted sense than the Upper House. Henceforward there will be less difficulty in obtaining a hearing in opposition upon merits before a House of Commons Committee, which may not be in all cases an unmixed boon. A corresponding series of amendments to the Standing Orders awaits the consideration of the House of Lords; but they do not raise any new or additional question.

The Meeting of the North British Association.

AN earnest, thoughtful meeting, must be the opinion regarding the North British Association meeting at Ayr on Thursday, which those who were present carried away with them. The "gathering of the clans" in the North is always a business of high purpose, though it would be an entire misreading of the character of the Scotsman to imagine that, along with the serious work of the occasion, time was not found for incorporating a goodly amount of joviality, not to go the length of saying jollity. As a matter of fact—seeing that the ladies are always welcomed—the social element is very much in evidence. With that we are not concerned, except in so far as enjoyment tends to promote harmony—and a meeting is never the less profitable because it is also pleasant, but rather the contrary. The Ayr meeting was one of the most pleasant in all respects that the Association have ever held.

Passing over the formal part of the proceedings, which, on this occasion, were happily neither protracted nor absorbing, the business was introduced by the President, Mr. T. Lighbody, of Renfrew, in a well-thought-out address. The paper by Mr. W. Young, of Peebles, was, as might be expected, a contribution of more than passing interest. It is safe to say that Mr. Young knows more about processes for the reduction of coal to its primary elements than any who put their hand to the subject. In this latest communication of his, he shadows forth lines of working in the production of gas which, if followed out, would lead to marked changes in gas manufacture. He is before the time in what he directs attention to; but therein lies the value of his paper. The question is, will it be followed up? Of his other great processes, one—that for the manufacture of oil gas—soon caught on, and was serviceable until it really defeated itself by bringing down the price of cannel coal. But as that was its main object, it may be frankly regarded as a helpmeet to gas makers which they duly appreciated. Another process—that for the purification of gas by ammonia in closed vessels—has not been taken up, which is the greater wonder because it was in all respects a complete and workable method of purification. It is to be hoped that a better fate awaits his suggestions in the present paper. The promised book of his collected articles will be looked forward to. When it appears, it will be a veritable mine for the intense gas specialist to dig deep into. In Mr. Waddell's paper the members had disclosed to them the application of simple mechanical methods to the conveying of coal and other ponderous materials in gas-works. So far as a hasty glance at the paper can enable an opinion to be formed, he has brought out a combination of devices which will greatly cheapen labour in gas-works, and indeed in other industries, and has done it in a way which will run accepted methods a hard race. It is not often that a District Association has two such important subjects brought before them at one meeting.

The remaining paper, by Mr. G. Keillor, jun., of Peterhead, on the manufacture of sulphate of ammonia, touched everyone who has charge of gas-works. He has himself shown what can be done in a comparatively small works, in looking out for, and getting into the till, the odd coin which is lying about most works; and he has, in addition, rendered valuable service in the collection and presentation in so clear a form of what is being done generally by colleagues in the same direction. The paper was thus a double-barrelled discharge; and its effect should be the quickening, commensurate with the energy he has thrown into his subject, of the interest of gas managers in a matter which they all have at heart. Though many have been working at it for years with profit, there are still many who have not yet taken it up actively; and even with those who have done so, there is room for further advance.

Gas-Engines for Water-Pumping.

IT is not frequently our pleasure to have a paper for publication which has such a common interest for both the gas and water engineering professions as the one presented by Mr. D. H. Irwin for discussion at the annual meeting of the British Association of Water-Works Engineers. Unfortunately, the author was not at the meeting to reply to the discussion his communication gave rise to. The topic on which Mr. Irwin wrote was that of "The Internal Com-"bustion Engine as a Pumping Medium;" and the discussion, we venture the opinion, shows how little attention the water engineers of the country have given to the subject. Even producer gas and big gas-engines, with their well-advertised performances, have failed to raise any enthusiasm and but little inquiry among water-works engineers; and we fancy there are few among them who have accorded any great and serious consideration to the question as to whether the new types of engines with producer gas would enable them to pump water more economically than the huge and, in most cases, beautiful steam plants they now possess.

This is rather a matter for astonishment in these days when in most industries attention is being directed to the question of how to produce economies of even fractions of a penny per unit of output, and all new claimants professing effect in this direction are well weighed. But it is not so surprising that there are not as yet, so far as our knowledge extends, any examples of water-works of any pretensions in regard to magnitude with combined gas producer and engine plants. One or two on a small scale are mentioned in the paper; but changes in the large, and for the most part well-organized, water undertakings of the country cannot, of course, be immediately or lightly made. The complaint is—let us make ourselves clear—rather that there has been such an insignificant amount of interest in the matter, than the fact that there is at present no actual demonstration of a town's water supply on a large or fairly large scale being provided through the medium of a gas producer and engine plant. Perhaps the want of interest may be traced to several facts. First, the affinity between steam and water is closer than between gas and water; then the steam-engine has obtained (but this is a poor reason in these days of progress) a kind of prescriptive right to first consideration in connection with water pumping; and again—and this is no doubt the strongest reason of the three—the comparatively small gas-engines of the past and the price of town gas prevented absolutely for many years any hope of displacing by that means the steam plant in point of economical working. So the gas-engine has been estranged from the consideration of the water engineer, excepting in a few isolated cases, and for small work.

However, the paper by Mr. Irwin may revive attention in the ranks of the water engineering profession to the possibilities of the present-day gas-engine as an economical pumping medium. Mr. Irwin is sanguine that the types of motors which he groups under the family name of "internal "combustion engines" will—aye, and must—displace the steam-engine; but the members of the Association did not appear to be in any very particular haste to subscribe to his buoyant confidence—simply, perhaps, because they have not thought very much over the matter. Of course, the leading factor that has given form to Mr. Irwin's view is the higher efficiency of the internal combustion engine over the steam engine and boiler; and then, in less degree, the accompanying savings in cost of attendance, labour, and upkeep, and in stand-by losses. No one in the discussion advanced anything of a satisfactory character to controvert the author's

case. The point as to the comparative efficiency was untouched; but those who had had actual experience with small installations were at one with him as to the concomitant advantages of the internal combustion engine. The only challenge came from Mr. Henry Preston, who, while endorsing the statement that the type of engine referred to supplied a cheap method of pumping water, did not think, on the point of cost of fuel, the author had made out a very convincing case. However, for small pumping installations, more particularly where necessity only demands intermittent work, the case for the gas-engine is amply proved by those who have had experience. But, speaking generally, Mr. Isaac Carr "hit the nail on the head" when he said that for surface pumping and forcing there is but little difficulty in applying the gas-engine with economy, but there is something yet to be done "in the matter of engineering development before the system of gaseous fuel can be applied to "the modern methods of deep-well pumping." He does not, however, say that this "something" is outside the region of possibility.

Mr. G. Hodson added a touch of interest to the discussion by describing the "Dynamic" gas process, and its application to gas-engine work. Like the author, he is satisfied that the days of the steam-engine are numbered. Indeed, so pleased is he with the process mentioned, that he is making a trial with it for water-pumping purposes, and he has promised to publish the results of his experience with it, whatever they may be. After what he has said about the plant, these results are bound to have interest both for gas and water engineers. Now that Mr. Irwin has set in motion this subject of the application of internal combustion engines to water-pumping work, it is to be hoped that water engineers will give to it a measure of consideration which we, with the author, are confident it deserves.

Birmingham Gas Policy.

In spite of a considerable amount of opposition, the Birmingham Gas Committee have succeeded in getting the City Council to agree to their proposals with regard to the revision of the charges for gas. The point chiefly dwelt upon by the objectors seemed to be that, under the suggested new scale, the very large consumers would benefit at the expense of the smaller ones. But the Chairman of the Gas Committee made it quite clear that they could not hope to retain the custom of the big manufacturers unless they were prepared to offer them special terms. And as the loss of these large consumers (without, of course, any corresponding lightening of the fixed charges) would adversely affect the users of gas for lighting and heating purposes, the latter should welcome, as being to their own advantage, the adoption of any reasonable means for preventing such a calamity. As was pointed out last week, there is no new principle involved in the present proposal of the Committee; the policy of differential rates according to the quantity of gas consumed having been adopted at the time the undertaking was acquired by the Corporation. If further evidence should be required than the statement of the Chairman of the Gas Committee with regard to the need of catering specially for the comparatively few very large consumers (who, however, take no less than 12 per cent. of the total quantity of gas sold), the unbelievers may be referred to the recent speech of Mr. Arthur Chamberlain at the annual meeting of shareholders in Kynoch's, Limited. On this occasion, Mr. Chamberlain contended that Birmingham gas, to be equal to that manufactured in Manchester, ought to be supplied to them at 1s. 9d. per 1000 cubic feet. Strange to relate, it was on the morning of the very day on which this speech was delivered, that the Sub-Committee agreed to recommend the proposals which were ultimately brought before the Council; so that Mr. Chamberlain's suggestion was in point of fact anticipated by the Committee. Naturally, therefore, the Gas Committee refer to Mr. Chamberlain's remarks in support of their recommendation; and it may safely be assumed that this gentleman will quote the reduction in price as proving the justice of his assertions. Both parties should therefore be pleased. The small consumer, too, has his price lowered to the figure which prevailed before the great increase in the cost of coal three years ago; so that it is difficult to see what he has to grumble at. The Committee are to be congratulated on having taken such steps as they are able to render impossible the successful competition with them of producer gas for power purposes.

The Beanfeast Nuisance

In view of the somewhat prominent manner in which the "Journal" has of late felt it to be a duty to deal with the "Beanfeast Application Nuisance," it is no small satisfaction to us to learn that one result of the recent changes in the staff appointments of the Gaslight and Coke Company has been the issuing of certain instructions by Mr. F. W. Goodenough (who, as our readers are aware, has recently been promoted to the position of Chief Inspector) which are calculated to put an end—at all events, so far as his Company are concerned—to the growing evil which the broadcast soliciting of subscriptions towards defraying the cost of employees' outings constitutes. These instructions, we understand, are to the following effect: (1) No application is to be made to any trading firm for subscriptions to the outings. (2) No representative of a trading firm is to be allowed to attend any outing of the employees. (3) No member of the staff of the Company is to attend the outings or beanfeasts given by any trading firm to their (the trading firm's) employees. Without going so far as did the small country newspaper which is reported on one occasion to have said: "We are glad to see that Mr. Gladstone has taken our advice," we may certainly take some credit to ourselves on the fact that such an undertaking as the Gaslight and Coke Company has adopted the same view as the "Journal" on this troublesome matter, even if the campaign against the system which has been carried on in our columns has not actually been the means of opening the eyes of the Company to the intolerable nuisance which it has become. We have a more important object in view, however, in referring to the subject on the present occasion than to draw attention to this confirmation, or adoption, of our opinions. What the Gaslight and Coke Company have done in this respect, other gas supplying authorities throughout the country can—nay, ought to—do. A determination on the part of gas engineers and managers to discountenance touting on the part of their employees for contributions towards the payment of the expenses involved in the annual holiday, together with a firm resolution on the part of traders to take no notice of such appeals when they are sent out, would very soon put an end to attempts to place upon shoulders which should not bear it the burden of defraying the cost of these outings. In this way, and in this way only, can we hope for a cessation of the loud complaints which at the present time are made (and very justly) against the prevailing system of soliciting subscriptions.

The Christmas-Box Tax

But, serious as it is, the beanfeast contribution does not represent the only (or the worst) tax which "custom"—that venerable excuse for so much that is reprehensible—practically compels trading firms to bear. There is also the giving of "Christmas-boxes," which habit (or perhaps it would be more correct to say "system") has of late years grown to such an enormous extent as to represent at the present time a heavy item in the liabilities of every trading company. Once upon a time there was, of course, the harmless box of cigars, of merely nominal value, which the recipient could fairly accept as a seasonable expression of goodwill—and nothing more. But more recently the practice has cropped up for the representatives of trading firms to (and we use this word advisedly) canvass each intended recipient, and ask him point-blank what he or "the wife" would like for Christmas. As a result, the presents—it is to be feared that this is altogether an inadequate word to express what they really represent—have grown from the (comparatively) insignificant "Havanah" to quite abnormal proportions. Though no objection can be, or ever is, taken to the remembering of one's friends at the Festive Season, and to the interchange of such small gifts as friendship, pure and simple, may dictate, it is far different when costly presents are made to pass between business acquaintances. So different, indeed, is it, that we have nothing but condemnation for the reasons that must prompt the giving, and the laxity which permits the accepting, of such articles as it has now become usual to distribute. Here are a few items picked out from a list of Christmas-boxes, which should suffice to convince the most sceptical of the righteousness of our contention: A safety bicycle, a collie bitch, a revolver, a set of golf balls, a fur-lined overcoat, a lady's sealskin coat, and a sideboard. What would the poor little, innocent box of cigars feel like in such company? Surely, if mere largeness of heart is answerable

for the distribution by trading firms of anything ranging from a collie bitch to a lady's sealskin coat, human nature must of late years have undergone a change. But as this must be admitted to be a "*reductio ad absurdum*," it is necessary to look elsewhere for the explanation. It is, unfortunately, only too easy to find! There may clearly be two opinions on the subject as to which party to these transactions is the more to blame—the firm who offer or the person who accepts these gifts. But whatever may be thought in this regard, certain it is the traders (who now find the system such a grievous hardship upon them) cannot be held quite blameless. Or, at least, the firm who started the practice cannot—for, of course, once the ball was set rolling, others were perforce compelled to follow suit. Inasmuch as the burden of this state of things falls entirely upon one side, it should rest with that side to make the effort to throw it off; and we are therefore rejoiced to hear that a meeting of some trading firms has just been held in London "to discuss the advisability of abolishing Christmas presents altogether." This is a very healthy sign; but the task these traders are wishful to perform is no light one, considering how deep-rooted has the pernicious system now become. If the trading firms cannot see their way to take combined action in the matter, gas engineers and managers can themselves strike an effective blow by absolutely declining to accept from manufacturers any gift the value of which is such as to give them good cause to think that the offering of it is prompted by a less worthy motive than friendship. Is it too much to ask them, for their own sakes, as well as for the sake of the profession generally, to do this?

And the Cheap Information Dodge.

While we are at it, there is still one other matter which should be pilloried along with the two "iniquities" to which attention has just been called; and this is our old friend (?) the Circular of Inquiry. Never does a very long time pass without our finding one or more of these requests for free information (forwarded to us by some one or other of the disgusted recipients) among our correspondence. In fact, their arrival may be looked for quite as certainly as that of the demand-note of the tax-collector. Another of these circulars is just to hand; but on this occasion there is a slight variation from the general rule, inasmuch as it is sent out by the Director of a Gas Company, who is writing on behalf of his co-Directors to the officials of certain neighbouring gas-works, to find out what is the practice "in regard to the matters referred to in the enclosed list of questions." This seeker after truth is good enough to own that "the information is required solely for the benefit of the Directors;" and therefore we beg leave to suggest that he might very well have added: "I have pleasure in enclosing cheque £10 10s., to repay you to some extent for the trouble to which you will be put in replying to my queries." What he really does say, however, is: "And, if you wish it, shall be kept entirely private." Now, there is no inherent objection to the list of ten questions which this Director so calmly puts—mainly dealing as they do with the way in which depreciation charges on meters, cookers, &c., should be treated in the accounts of the undertaking—but a complete, carefully-compiled reply to them would constitute a valuable essay on the subject. What absolutely passes our comprehension is how any man can expect to get strangers to prepare such essays for him, merely at the cost of sending out a type-written letter and list of questions, together with a stamped addressed envelope for the reply. The knowledge desired in this particular instance is not unattainable in the ordinary way of business; why then should it not be so obtained? There are hundreds of accountants fully competent to advise the Board, if the members of it are not sufficiently "men of affairs" to be able to deal properly with the matter on their own initiative. A good round fee would, of course, be charged; but then a professional opinion has at least as much claim to be paid for as have the services of a Director in managing the business of a Gas Company. There is one case, and one case only, in which the Circular of Inquiry can be at all justified; and that is when the information required cannot possibly be come at by any other means. But this is a condition of things which is seldom met with. In the great majority of instances (as in the case in point) such circulars merely represent an inglorious attempt to procure—at the cost of a few penny stamps and a small amount of stationery—information or advice which should be paid for in the same way as "counsel's opinion" or the services of a medical man. In this instance again, however, gas engineers and managers have the remedy in their own hands. The waste-paper basket is the most fitting repository for all such appeals, and to it they should be ruthlessly consigned. Happily there is reason to believe that this is a course which commends itself to an ever-increasing number of victims.

The Higher Aims of Municipalities.

Whatever might be one's views on the subject of the present-day tendencies of Municipalities, it would be impossible not to admire the eloquent statement of the aims and accomplishments of the Bradford Corporation made by Mr. J. A. Godwin, the Chairman of the Finance Committee, when introducing his annual statement last week. After pointing out that in Bradford all, or nearly all, the public services were municipalized, he went on to say that, above all other advantages realized by the Corporation, the health of the people had been advanced and the death-rate reduced. Closer inspection of conditions of labour, of sanitation, and of food stuffs, preventives against the spread of infectious diseases, and baths had had their share in this good work. Slaughter-houses, storage equipment, and markets had also added to material comfort. The lives, safety, and morals of the people were better looked after. Art galleries, museums, parks, and open spaces provided recreation; and free libraries and technical instruction cultivated intellectual faculties. Labour might be more exacting, the pace at which we lived more exhausting, the competition more fierce, but surely the conditions under which the people lived and worked were vastly improved. Here we have set forth the better view of Progressive Municipalism; it has too often been our duty to draw attention to the less pleasing aspect of the question—the undertaking by local authorities of grave risks which private capitalists are perfectly willing, and far better suited, to incur.

The New Trade Union Policy.

The success of the Independent Labour candidate on the occasion of the recent election at Barnard Castle came as a great surprise to most people; and various reasons have been advanced to account for it. It was not, however, until the representative of the "Pall Mall Gazette" buttonholed Mr. Will Crooks, the Labour Member for Woolwich, in the Lobby of the House of Commons, that the true inwardness of the matter was explained. Mr. Crooks, we are told, was "beaming with satisfaction"—as well he might be, for it was a notable victory for his side—and he was quite ready to show "how it was done." In going about the constituency, he found a distinct tendency to throw over the political parties; and as out of the 11,000 voters in the division some 7000 are miners and Trade Unionists, the success of anybody these sections of the community could be induced to support with something like unanimity was assured. But a much wider aspect of the question was revealed in the answer given by Mr. Crooks when the interviewer asked him whether there was anything unusual to account for the recent Trade Union parliamentary successes. This answer was to the following effect: "These successes are the result of a new policy adopted by Trade Unionists. Shortly, it is this. Instead of spending our money on strikes, we are spending it on electioneering; and the decision has so far been amply justified. Not that we ever wantonly provoked strikes, as some people seem to imagine—in fact, a Trade Union official, who does not at any time want labour quarrels, spends at least seven-eighths of his time in preventing disruptions—but we are seeking for a surer means of making our influence felt, and a means which will have better results." It is to be feared that Mr. Crooks has a somewhat short memory on certain points; for if some of the Trade Union officials whose names have at different periods occupied public attention spend seven-eighths of their time in preventing disruptions, they have managed to make themselves remarkably busy during the remaining one-eighth. But we are not inclined to insist too much upon this; more importance is to be attached to the outlook for the future. In this respect, Mr. Crooks's declaration is full of promise. Harassed employers all over the country will hail with joy the news that strikes are really to be discouraged; and perhaps even Mr. Carr, the Manchester painter whose case was referred to in these columns last week, will venture to hope that his tormentors will henceforth confine themselves to endeavouring

to get each other elected to the House of Commons. While strikes have done an incalculable amount of injury to the business of the country, the capacity for harm of the Trade Unionist when elected a Member of Parliament is very limited, whereas, on the other hand, he may do much good. In any case, it will be easy for the new Trade Union policy to have "better results" than have followed from the interference between master and man which has of late constituted the principal stock-in-trade of these organizations.

The Settle-Padfield Carbonizing Process.

We published last week a communication from Mr. Norton H. Humphrys, giving the results of some further tests of this process, which show a considerable advance on all previous figures. Apparently, it has been found possible to dispose of the whole of the tar, with an increased gain as regards gas and coke. Compared with the ordinary working, a gain of 25 per cent. or more in respect to the yield of gas is recorded, and a slightly less increase as regards sperm value. These results are obtained from a cheap small coal stated to be obtainable at two-thirds the price of ordinary gas coal. It has for years been remarked that the residuals ought to pay for the cost of the coal; but we believe this is the first time that they have been claimed to show a profit on it. The patentees are inviting the most searching investigation of the process; so that any gas engineer is at liberty to satisfy himself as to its capabilities.

WATER AFFAIRS.

A London Water Company Rebuked.

The district supplied by the East London Water Company comprises a portion of the Metropolis where one does not expect to see the refinement of manners usually associated with the West-end of the town; and therefore it is not surprising to find the Company occasionally troubled with obstreperous customers who are only to be brought to reason through the medium of the Police Courts. As a consequence, the Company's name has figured in the records of these interesting and useful institutions more frequently than that of any other in the Metropolis. From some cause or another, they seem to have been fated to be frequently engaged in litigation; and we must acknowledge that in most cases they have been forced into it by circumstances. It is therefore to be regretted that they themselves had to be summoned before Mr. Mead, at the Thames Police Court, for what, on the facts as reported, appears to have been an unwarranted act of harshness. A consumer of some years' standing—a surveyor by profession—received notice of a leakage in his communication-pipe, and promptly took steps to have it stopped. The work was done, and the sum of 11s. 6d. was demanded for opening the road. But because the consumer did not immediately pay the money, which he promised to remit, he was deprived of his supply of water; and, upon writing to the Company on the matter, was coolly informed that he would have to pay 23s. 2d. before he could have it laid on again. The complainant was kept for seventeen days without a supply of water; and he proceeded against the Company in order to have it restored. The Company justified their action in refusing to furnish the supply on the strength of the decision in the case of the *Sheffield Water-Works Company v. Wilkinson*, where the successor of a defaulting consumer was denied a supply until the arrears had been paid, and he had himself restored the communication-pipe—the tender to the Company of the cost of such restoration not being sufficient. It was also urged that, though the complainant had paid his water-rate up to Christmas, so as to bring himself within the provisions of the Act of 1847, he had not done so on the proper day. While admitting that the Company were legally right in not reinstating the supply, the Magistrate considered they had committed a breach of the Act in cutting it off, and had altogether behaved towards the consumer in a very high-handed manner. We are entirely in accord with his Worship in this expression of opinion, and can only regret that the Company should have justified it by the precipitate action of their servant.

The Water Riots in Trinidad.

It is probably within the experience of many of our readers that the discussion of questions bearing upon water supply has not seldom given rise to a good deal of acrimony among the mildest and most inoffensive of municipal councillors and members of some local governing bodies. Indeed, the acerbity which was frequently displayed when the Metropolitan Water Supply was under debate led to its being called the "hot" water question. But however fierce these wordy contests may have been, they never, so far as we are aware, led to blows, to breaches of the peace, or to bloodshed and death. One can scarcely imagine such dire results arising out of the consideration of so essentially domestic a subject as the provision of a supply of water. Yet this unfortunately occurred in the Island of Trinidad towards the end of March. Particulars of the riots which appeared in the London newspapers at the time have just been supplemented by two Government publications, one of which is the report of the Commission of Inquiry appointed by the Secretary for the Colonies, and the other a Blue-Book containing papers and official correspondence on the matter. The report is not pleasant reading. It shows how a body of agitators, having a real or supposed grievance against the authorities, can rouse an ignorant populace, and incite them to rebellion; and it likewise reveals deliberate disloyalty or cowardice on the part of officials whose first duty should have been to protect the peaceful inhabitants from the effects of the miscreants' conduct. By good fortune, two of His Majesty's ships were lying in the harbour at the time, and a force landed from them, with the aid of some troops from Barbados, succeeded in restoring order, but not before the Government buildings were destroyed, and damage done to the extent of about £40,000.

The question which had given rise to all this trouble was the water supply of Port of Spain, the chief town in the island, and one of the finest in the West Indies, having about 54,000 inhabitants. Owing to diminished rainfall, but in a far greater degree to wilful waste, the supply of water had become inadequate. This waste had, it seems, been going on ever since the water-works were constructed some fifty years ago, and measures had been adopted with the view of checking it, especially at night, when apparently half the consumption takes place. Without troubling to ascertain the views of the leading residents on the matter, a Water Bill was introduced into the Legislative Council, and pressed forward—according to the report, with undue haste, and with as little consideration as if the measure had been one of the smallest pieces of routine legislative business. It was not thought advisable to lay out money in adding to the sources of supply while the available water was being so recklessly wasted; and the Bill was drafted with the object of putting some check upon the existing practices. If it had been passed, an ample supply of water would have been ensured at a slightly increased cost, which would still have been lower than the price being charged in other places on the island.

The provisions of the Bill, however, caused some dissatisfaction, which a group of agitators, to serve their own purpose, fomented into turbulence, and eventually, as already stated, into riot, which ended in slaughter—several people being brutally killed by the police without any justification whatever. The Commissioners do not consider the authorities altogether blameless in the matter, inasmuch as they did not take adequate steps to maintain order and preserve the peace. They are of opinion that, before any further proceedings are taken in the Council, the draft ordinance for dealing with the water-works should be referred to a Select Committee, whose duty it would be to report specially as to the provisions to be made for the prevention of waste, the imposition of rates or charges, and the constitution of a water authority for the town. The report of the Committee would, of course, come before the Legislative Council, who would reject, modify, or adopt any recommendations made. The question would then be considered, so to speak, under the public eye, which, as we gather, was not the case with the Bill. If there had been a little more openness and a little less haste displayed by those who were responsible for the measure, permanent reform might have been effected, to the general good of the inhabitants. But as it was, the methods adopted for bringing it about only produced irritation, and ended in a calamity the effects of which it will take years to efface. The outcome of the riots will probably be stricter supervision over the sale of arms and ammunition.

ESSAYS AND REVIEWS.

THE GAS AND WATER STOCK MARKET.

THE week just closed on the Stock Exchange was, on the whole, very flat and depressed, though it was not altogether at times without a brighter moment—showing that it only wanted a little encouragement to throw off the load of apprehension that oppressed it and kept business torpid and prices low. So sensitive were even the best markets, that prices would sometimes jump about from hour to hour. Americans and Chinese affairs were the levers that worked the movements; and the whole machinery was quick to respond. The fortnightly settlement was a matter of difficulty, and has been attended with several failures, though not of great magnitude. In the Money Market there was a brisk demand for the Stock Exchange, and discount rates were rather harder. But there is nothing to point to any lasting stringency. In the Gas Market, business was on a fairly active scale—considering all things; but with a short week (the Exchange was closed on Saturday) and a Bank Holiday before it, the market was not likely to be very lively. Changes in quotation were few and slight; and the tendency on the whole was not bad. Still, it is not quite so good as it might well be expected to show; and the recovery seems rather a long time in coming. Such accounts of the last half-year's business as have come to hand during the week yield additional confirmation of the expectation expressed that it has been a good half year for gas generally. In Gaslight and Coke issues, there was a very fair amount of business done at steady prices; 86 being about the centre on which they turned. But the secured issues (like many other high-class investment securities during the week) were far from strong, and the preference fell a point. South Metropolitan was in demand, and was full of strength; the rise in prices marked almost running away from the quotation. But the debenture was another instance of weakness in high-class stocks. Hardly anything was done in Commercials, and prices were very moderate. The Suburban and Provincial group was particularly quiet. Here, too, the prices marked seemed low. In the Continental Companies, Imperial was flatter, and the buying price fell a couple of points. But the others were unchanged. There was nothing to note in connection with the remoter undertakings. The Water Companies were hardly dealt in; but the tendency was downward.

The daily movements were: On Monday, Gaslight preference and Imperial fell 1 each. Southwark Water fell 2. On Tuesday, South Metropolitan rose 1; but ditto debenture fell 1. On Thursday, Southwark Water fell 1 more.

LORD AVEBURY ON MUNICIPAL TRADING.

OUR readers are doubtless aware that an association has been formed, under the title of the Industrial Freedom League, to "free private enterprise from undue interference and from rate-aided competition." The President of the League is Lord Avebury, who at the first annual meeting of the association, held a few weeks ago, explained its object, and delivered an interesting address on the subject of municipal trading. A report of the proceedings has been forwarded to us by the Secretary (Mr. P. S. Bridgeford), and we extract from the address a few particulars of interest to our readers.

The League was founded last year at a large and representative meeting held at the Westminster Palace Hotel, under the presidency of Sir Alexander Henderson, M.P., when Lord Claud Hamilton, Mr. Vicary Gibbs, M.P., and other gentlemen representing important commercial and manufacturing industries, were the speakers. The meeting was convened in consequence of the gradually increasing anxiety felt with reference to the increase of rates, the growth of municipal indebtedness, and the check to individual enterprise. The organization which was the outcome of the gathering has received a considerable amount of support—testifying to the interest taken in the matter. The League has been actively at work for only about twelve months; yet Lord Avebury says it may, with some reason, claim to have exercised much influence in forming public opinion upon the question of municipal trading. The campaign it has carried on has borne fruit; and already a reaction is evident against the unlimited piling up by local authorities of debt for speculative undertakings. The formation of the League was not, as is sometimes alleged, an attack on municipal institutions or municipal bodies. Its promoters cordially recognize the valuable services these institutions have rendered and are rendering to the country, and they acknowledge the existence of a desire to improve the condition of the people. They are therefore in a position to discuss the question calmly, and approach it in the spirit most likely to lead to a wise decision.

Lord Avebury remarks that there are many who honestly think that municipalities, by undertaking various businesses, may make a profit, and thus benefit the community in two ways—by supplying the necessaries and conveniences of life at low prices, and by reducing the rates. Others, on the contrary, believe that our municipalities have their hands quite full enough; that individual enterprise and the stimulus of individual interest enable private enterprise to work more economically than Governments or Municipalities; and that municipal interference will inevitably check the progress of discovery and invention. The supporters of municipal trading speak contemptuously of "private speculators." To his Lordship's mind, there is a wide distinction between legitimate enterprise and anything which can correctly be called "speculation." But if speculation is the right word, then he submits that speculative investments ought not to fall within the limits of municipal duties, or to be made with ratepayers' money. That Governments and Municipalities should, as far as possible, abstain from entering into business, was the opinion of Cobden and Bright, of Fawcett and Mill.

His Lordship goes on to indicate two ways of bringing this question to a fair test—the first being by general considerations, the second by figures and statistics. The whole subject is so complex that the former argument weighs most with him; but the figures also point clearly to the desirability of restraining municipal trading within the narrowest limits. The supporters of municipal trading claim that the result has been a substantial profit; but, of course, as Lord Avebury remarks, "when municipalities have a monopoly, and can charge what they like, it is easy to make a certain profit." Monopolies, however, especially those in the hands of Governments or Municipalities, are bad, because they are the most difficult either to control or to abolish. His Lordship doubts whether the profit which Municipalities claim to have made, has any real existence. Their accounts are difficult to follow, and in some cases are so dealt with as to show "paper" profits only. Of course, he does not impute any intention to deceive; but it is obvious that when accounts are treated in this way it is difficult to draw conclusions from them.

Coming to the subject of gas, Lord Avebury questions whether the possession of gas-works by municipal authorities really benefits the community. He says the facts seem to show that it does not. The circumstances of towns differ, so that it is not possible to arrive at an absolute proof. But the figures are significant. He cites the following places where, in January last, the price per 1000 cubic feet of gas was as given: Birmingham, 2s. 9d. to 2s. 3d.; Bolton, 2s. 6d.; Bradford, 2s. 3d. to 1s. 11½d.; Hull, 2s. 8d.; Leeds, 2s. 3d.; Leicester, 2s. 4d.; Manchester, 2s. 9d.; Nottingham, 2s. 10d. to 2s. 4d.; Salford, 2s. 8d. and 2s. 7d. By way of contrast, he gives the following towns supplied by companies: Bristol, 2s. 3d.: Hull (British Gaslight Company), 2s.; Liverpool, 2s. 8d.; Newcastle-upon-Tyne, 2s. 1d.; Plymouth, 1s. 9d.; Sheffield, 2s. to 1s. 8d.; York, 2s. 2d. to 1s. 11d. These figures show that, in places supplied by companies, gas is substantially cheaper than where the service is in the hands of the municipal authority. A striking example of the advantage of company as compared with corporation management is afforded by Sheffield and Nottingham. Fifteen years ago, the price was the same in both towns. In the latter it has gone up, in the former down; till now the average in the Midland town is 2s. 8d., against only 1s. 8d. in the Yorkshire one. Apart, however, from the question of price is that of quality. Lord Avebury expresses his indebtedness to Sir George Livesey for information on this point to the effect that in Manchester the gas is of 19-candle power, whereas in Liverpool it is 20-candle; while the latter gas is so much more rigidly tested than the former that the difference is really equivalent to 3 candles. Where gas is supplied by companies, the municipal authorities keep a strict watch over the quality of the gas supplied; but where it is in their own hands there is no such supervision. Lord Avebury considers that, on the whole, the sliding-scale arrangement in regard to price and dividend is the best for the public.

Turning to water supply, Lord Avebury takes the case of the purchase of the undertakings of the London Water Companies. He points out that a prominent supporter of municipal trading had argued that purchase would mean, to begin with, "a more generous supply of water at lower prices;" and, moreover, that "the community, instead of paying 10 or more per cent. in perpetuity to the Companies, would wipe the original capital out of existence in fifty or sixty years." His Lordship points out that if the capital on which 10 per cent. is paid could be acquired at par, it would be a very good business. But, of course, the works will have to be purchased at a valuation, so as to give the shareholders about their present income. To talk of 10 per cent., therefore, is most misleading. Referring to the late Mr. E. J. Smith's valuation made in 1879, Lord Avebury shows, on the authority of a report of the Water Committee of the London County Council, that the aggregate of the annuities proposed by Mr. Smith would for the years 1880 to 1890 have been £9,555,719, while the actual profits earned during this period would have been £8,498,180. So that if the purchase had been carried out there would have been a loss of £1,057,539. We shall soon see what sort of a bargain the Metropolitan Water Board will make with the Companies; and the future will show whether London is better or worse off for the transfer to that body of the control of the water supply.

After dealing with the Works and Tramways Departments of the London County Council, Lord Avebury concludes by an expression of regret, on four grounds, at the present tendency to

municipal trading. In the first place, our municipalities have, he says, already enough, if not too much, to do. Secondly, municipal trading will lead to an immense increase in municipal debt; and, thirdly, it will involve municipalities in labour disputes. Then, as there will not be the same stimulus to economy and attention, there will be great probability, not to say certainty, that there will either be a loss or an increase in the cost of the service. Finally, municipal trading will be a serious check to progress and discovery. These, succinctly put, are the views of Lord Avebury of this important subject; and they deserve the attentive consideration of all who are interested in it.

THE EXCLUSION OF GAS FROM MUNICIPAL HOUSING.

"THEY will not, as a matter of fact, be allowed to use gas at all." This statement occurs in the introduction to an article that appeared in the "Municipal Journal" for the 24th ult., purporting to describe the Battersea Municipal Houses on the Latchmere Estate, which were formally opened by Mr. John Burns last Saturday. The statement strikes one as sufficiently startling to call for particular notice in these columns; and doubtless the Administration of the Gas Company particularly affected by this peculiar development of Municipalism, and the Directors of other gas companies which may at any time be similarly attacked elsewhere, will take due notice of the circumstance. We have on several occasions discussed the modern municipal phase of the question of the housing of the working population in towns, feeling instinctively that this is a matter in which the fortunes of the gas industry are naturally involved. This latest piece of news is the climax which justifies our foreboding. It may be that the Battersea Borough Council, being largely compact of Socialists and Trade Unionists who have no love for gas companies, have gone farther and faster in the way of creating a municipal monopoly than others are quite ready to do; but this decision of theirs is a good deal more than the proverbial straw which shows the direction of the municipal wind. One can hardly suppose that the members of the Battersea Housing Committee, who have allowed themselves to be led by the nose in this matter of denying the use of gas to the occupants of the rate-provided dwellings, realize the enormity of their offence against freedom of dealing, which is tantamount to an infringement of the principles of the Truck Act; but the outrage is not one to be lightly passed over.

The following are the particulars given by our very municipal contemporary of this remarkable development of municipal trading. The tenants of the new dwellings "will possess the advantage of being able to use the electric light at a charge less than the price of gas which rules in the district"—which, by the way, is the cheap South Metropolitan figure of 2s. 3d. per 1000 cubic feet. Then comes the amazing condition already announced, that these unlucky people are not to be permitted to use gas at all—which prohibition must extend to any and every application of gas, whether for cooking or heating, as well as for lighting. Such is Battersea Free Trade. The pretension that the price of electric light—of course, from the municipal shop—is to be cheaper than gas, is based upon the offer of the former to tenants by slot-meters, at 4d. per unit. All the fittings will be provided by the Council, free, in the first instance; but lamp renewals must be done by the users, who will be able to obtain supplies from the Superintendent at cost price. "The arrangement means that about 7½ hours' light from one ordinary 8-candle power lamp can be obtained for a penny." It appears from this lucid statement that the occupants of these domiciles are expected to be content with 8-candle power lights, which they mustbuy at the municipal shop on the premises. If they should dare to desire anything less depressing than this "darkness made visible" scale of lighting, which nobody else in London will put up with, they must have recourse to petroleum lamps or else the cheap, evil-smelling paraffin candles of the chandler's shop. Those denizens of Battersea who are not municipally housed can have incandescent gas, if they like, giving a light of 20 candles per cubic foot, and purchasing 27 times this effect for a penny. This is how the equality of municipal electric light works out in this case! Or the common flat-flame gas-burner will give a better light than the municipal electric lamp for a consumption of under 3½ cubic feet per hour, which again beats the electricity. The assertion, therefore, that the supply of electric light to these dwellings on the terms stated will be cheaper than gas, is simply false.

Even so, it seems that this precious scheme of forced municipal trading has not escaped local criticism, which alleges that the whole thing must work out at a loss to be borne by the rates. It is not quite clear whether this impeachment applies only to the electric lighting, or to the whole housing venture. As regards the former, it is very reasonably doubted if slot-meter supplies of electricity at 4d. per unit, inclusive of the fittings, can possibly be remunerative. One would say unhesitatingly that it cannot be done at the price named. Even slot-meter gas supply, without the use of a cooker, however small, does not pay. The number of lighting hours in the case of working-class householders is too small, and their requirements of light altogether too limited. Having regard to the question of the load-factor, this class of consumption is probably about the least profitable that any electric lighting station could undertake. But, of course, all such considerations are set at naught in this instance The Battersea Borough Council are struggling with an electric lighting undertaking from which no analysis of accounts appears in the usual place for information of the kind. Like many other municipal concerns of the same order, the official statement of accounts of the Battersea electricity supply is much behind time; but it is believed to be comfortably losing about £5000 a year. If this is its general condition, which indicates that the speculation is one of those superfluous ventures that illustrate municipal "enterprise" to the discredit of municipal prudence, the temptation to acquire customers by main force in connection with the borough housing scheme is explained.

The forbidding of gas for cooking purposes to the dwellers in these "model" buildings is less pardonable than the enforced use of electric light, seeing that the alternative is smoky coal fires. Lest there should be any misunderstanding on this head, it may be remarked that the arrangement of kitchen range, bath, and copper is claimed as a special feature of the building scheme. This, of course, is as it should be; for a good arrangement of the kind is the centre of the efficiency of the plan of accommodation. We have no objection to state that the particular combination selected in this example is the invention of Councillor Cornes, of Leek, Staffordshire, whence it has spread considerably. This is greatly to the inventor's credit; but nevertheless the advantages, and especially the cleanliness, of gas cookers for artisans' use, mornings and evenings, greatly surpass anything that can be claimed for a coal range, and have a bearing upon the smoke problem of the Metropolis which seems to have been ignored in Battersea. It is not difficult to perceive that what would be a perfect kitchener for Leek (which is not greatly concerned with the town smoke problem) might not be so very unobjectionable for London.

Did the practical mechanics who were instrumental in settling this business for Battersea sufficiently realize what it means to light fires for the morning and evening kettle? As a matter of fact, the alteration that has been wrought in the coal trade, as well as in the atmosphere of South London, by the slot gas-meter amounts to a revolution. The small shops where coal is to be bought by the pennyworth have almost dropped out of existence. Where their dirty merchandise, supplemented of late years with briquettes, used to overflow the street pavements, there is scarcely a stain of coal dust to be seen. The trade has dwindled to the vanishing point. The same story is told by the perambulating dealers in coal, who were in the habit of sending their vans through the poor streets in the summer time, selling the small quantities of kitchen coal required by limited households during the warm weather. Even the large retailers of coal were not above keeping their horses and men employed in the summer in this way, which they found very profitable. Now this branch of trade is practically dead. The coal merchant's summer retailing occupation is gone, thanks to the slot gas-meter; and the corresponding demands on the supplying firms are sadly shrunk. Even the Coal Exchange feels the difference. And this is the reformation against which municipal enterprise, as understood at Battersea, is now set in the interest of municipal "truck!" Apart altogether from the purely commercial interests affected, it is a reactionary proceeding, regarded from the point of view of public health and smoke abatement.

Of course, the idea that municipal tenants can be lawfully prevented by the landlord from applying for a supply of gas from the statutory undertakers, is a purely fantastic suggestion of an exaggerated Municipalism. Clause 11 of the Gas-Works Clauses Act, 1847, stands for the protection of the occupier in this connection; and it would be interesting to know if the attention of the Borough Council has been called to this provision. A householder is not bound to obtain the consent of the landlord to an application for a supply of gas under the Act; and there is a remedy against any attempt on the part of the landlord to interfere with the tenant in the exercise of his lawful discretion. There may perhaps be an endeavour to embody some such engagement in the form of tenancy agreement; but it is for the Gas Company to see if this would hold good. If so, there would have to be a Battersea clause (forming a pendant to the Bermondsey clause), to make it clear that no advantages or disadvantages shall be entailed upon occupancy of municipally provided dwellings.

It has been strongly urged in the "JOURNAL" on previous occasions that gas companies should offer their co-operation in every way in rendering improved dwellings for the working population of towns, or town colonies, as convenient and comfortable as possible. The convenience and comfort of gas to the workman's family are not to be gainsaid. If the Battersea Borough Council have really and truly, as reported, attempted to debar the occupiers of their Latchmere Estate from the use of this accessory to civilization, this saving of the labour of the most laborious worker in the world—the workman's wife—then are they unworthy of their office. What is grandmotherly legislation to this freak of Progressivism? It is the right way to make the people prefer a slum, with liberty, to the choky terms of the municipal landlord Just as there is too much notice board to the average municipal park, so there is apt to be over-regulation of the municipal tenant. And, after all, it is not the man who will sign an agreement with the utmost readiness who makes the best tenant.

ELECTRIC LIGHTING MEMORANDA.

Another Marylebone Development—The London County Council and the Depreciation Question—Fancy Methods of Charging for the Electric Light—Electricians and Gas Engineers.

THE development of the Marylebone muddle is proceeding with all due deliberation. The Finance Committee of the London County Council, at last week's meeting of the Council, brought up their further report on the matter, dealing with the situation created by the decision of June not to sanction the borrowing by the Borough Council of the sum of £1,274,000 required for the purchase of the electric light undertaking in the district. The ground of the refusal was that the Council were advised that they could not sanction the proposed loan without further statutory authority being given to the Borough Council authorizing the transaction. Since then the Parliamentary Agents to the borough have written asking whether, if the Borough Council obtain a licence from the Board of Trade, under the Electric Lighting Act, 1882, to supply electricity within the district, this will remove the legal difficulty in respect to the loan. Counsel's opinion has been obtained on the point, and the advice is in the affirmative. Inasmuch, however, as the maximum duration of a licence is only seven years, it would be necessary to limit to this period the time for the repayment of the loan. After the purchase has been completed and the undertaking started under the terms of the Borough Council's Order of 1901, the Council will be in a position to extend the period for repayment accordingly. This seems a roundabout way of getting out of the present difficulty; and the Finance Committee of the County Council evidently do not half like it. They are not blind to the fact that a section of the ratepayers do not approve of the loan at all. But there is the Act of Parliament for the acquisition of the undertaking, and the order of the Court directing specific performance. In the circumstances, the County Council are not in a position to exercise any discretion in the case. It has accordingly been decided to inform the Borough Council that the suggested expedient of obtaining a licence from the Board of Trade will remove the legal obstacle to the sanctioning of a loan; and that afterwards the County Council will be in a position to consider such application upon its merits. There is not much comfort for Marylebone ratepayers in this; but it will bring the result so much nearer.

Meanwhile, a further step has been taken by the County Council to make clear their position as regards the question of depreciation allowances for the electric lighting plant of Metropolitan Local Authorities. The Poplar Borough Council asked for an advance of £3525, repayable on the instalment system within 42 years, with three years' postponement of the commencement of repayment, on account of the initial establishment of the electric light within the borough. The Finance Committee of the County Council consider that the application may be granted to the extent of £3345; but without postponement of repayment, as the undertaking is at work. However, the condition has been attached to the grant, that the Borough Council shall agree by resolution "to provide, out of a sinking fund to be established for the purpose, or from maintenance account, for all renewals and replacements during the currency of the loan of any plant or machinery purchased with the proceeds thereof." This, of course, covers the whole ground. It should be impossible for other local authorities engaged in the same kind of business to argue that the repayment of a loan is the same thing as making provision for the renewal and replacement of the asset acquired by its expenditure, seeing that the London County Council require both provisions to be made independently.

At the recent meeting of the municipalized electricians, a good deal was said concerning different fancy ways of so charging for electric lighting that the consumer may believe he is getting his electricity cheap. It seemed to be generally agreed that everything depends on this manœuvre; but, as usual, there was much conflict of opinion as to the estimation in which the maximum demand system of charging is held by consumers. It is quite possible to agree with those electricians who maintain the essential fairness of the principle, having regard to the fact that electricity is a commodity that cannot be stored. Really, the metering of a supply of electricity for lighting, or even for power purposes, is an inconsistent proceeding, though it is economical. At best, it is a device for reconciling the very different interests of the undertakers and the consumers, which it does very imperfectly. There are some consumers, for example, whose custom would not be worth having at any price that could be placed upon the unit. In the case of a small central station supplying a diversified demand for about 10,000 lights, it would be impossible to say how much per unit ought to be charged for a mill with 1000 lights liable to be wanted for half-an-hour on a winter's afternoon. This is an extreme example; but it is no fancy picture, and the difficulty is, after all, merely one of degree.

Mr. Ruthven-Murray, of Willesden, has evolved a style of charging with which he is immensely pleased. How it strikes the consumer, there is at present no evidence to show. He has his maximum demand meters graduated in lamps instead of in kilowatts—the latter being a "fearful wildfowl" which the British public cannot away with. The meter apparently counts up the number of lamps, taken at 8-candle power, in maximum demand; and the quarterly bills are made out for so many of these lamps at 1s. 9d. apiece, and 1d. per unit besides. This is alleged to be "exactly the same in the end as the Wright system on the basis of 8d. and 1d." But the consumer understands it better; and as for the "penny unit," its advertising value is asserted to be great. Possibly. We shall see. It is early days with the Willesden undertaking, and anything will go smoothly in the circumstances. Mr. Ruthven-Murray, unless we are mistaken, has had some gas-works experience. In this respect, he is paralleled by Mr. Harold Woodall, at Bournemouth, who does not forget the electrical phase of his professional development. What a desirable thing it would be, if there were to be a good deal more of this duality of engineering experience! There is, of course, much more of it, especially in the manufacturing districts, than is usually suspected; and it has never been proved that the doubling of the parts of gas engineer and electrician has produced any ill-effect other than the overtaxing of a willing worker. Filling the two offices simultaneously, however, is not the kind of training that is to be most desired, which is that young engineers should have spells of both kinds of experience before settling into one career. Nothing but good could result from such duplex training.

PERSONAL.

Mr. WILLIAM M'CRAE, late of Dundee, was appointed Manager of the Falkirk Corporation Gas-Works by the Town Council on Monday last week, in succession to Mr. J. Kincaid, who is going to Kirkcaldy. There were 24 applicants for the post.

Mr. ANDREW THOMSON, Assistant-Manager at the Inverness Corporation Gas-Works, has been appointed Manager in succession to his father, Mr. James Thomson, whose sudden death was noticed last week. The vacancy was not advertised. At the special meeting of the Town Council at which the appointment was made, Provost Ross paid a very high tribute to the memory of Mr. Thomson; and it was agreed to record the profound sense of the loss the Commissioners had sustained by his death.

An American Catalogue of Fuel-Gas Appliances.—We learn from Mr. Irvin Butterworth, the Manager of the Denver (Col.) Gas and Electric Company, that, being desirous of preparing a complete illustrated and descriptive catalogue of all industrial fuel-gas appliances now in successful use in America and other countries, they have been taking steps, by the issue of circulars to all the American gas companies, to obtain drawings and detailed descriptions of such articles. It is explained that by "industrial fuel-gas appliances" is meant especially those used for manufacturing and industrial purposes—in fact, anything apart from domestic fuel-gas apparatus now in ordinary use for cooking, heating water and rooms, &c. It is intended to make the catalogue a valuable one for all gas companies; and copies of it, when published, will be sent gratis to all who have assisted in its preparation in the way above indicated.

Incandescent Gas for Railway Carriage Lighting in France.—For some few months the first-class compartments of the Western of France Railway have been lighted by inverted incandescent gas-burners, with the result that great improvement has been effected by the abolition of shadows. With a consumption of 0·5 cubic foot of rich gas per hour, a light of 30 decimal candles is given; whereas only about two-thirds of this yield is obtained with an ordinary incandescent burner. In order to make the inverted burner work effectively in the carriage lamps, means had to be adopted to prevent the products of combustion mixing with the air feeding the flame, and consequently reducing the photogenic power of the mantle. The device employed consists of a special chimney formed of two concentric truncated cones arranged so that the exterior one discharges the products of combustion, while the other forms an air chamber, which communicates directly with the exterior by three nozzles, and moreover acts as a heat-regenerator. It is said the system has given such satisfaction that the Company intend to adopt it for the suburban trains.

Irish Association of Gas Managers.—We learn from the Hon. Secretary of the Association (Mr. James Whimster, of Armagh) that the annual meeting will be held in the Town Hall, Waterford, next Tuesday, under the presidency of Mr. J. G. Tooms, the Manager of the gas-works. The technical business will comprise the President's Inaugural Address, three papers, and a lecture. Mr. R. Bruce Anderson, Assoc.M.Inst.C.E., will furnish some information in regard to gaseous firing at Waterford; Mr. W. Dunn, of Queenstown, will sketch the progress of regenerative firing since 1880; and Mr. John Paterson, of Tipperary, will deal with the subject of unaccounted-for gas. The lecture will be delivered by Professor C. R. C. Tichborne, LL.D., Gas Examiner to the Board of Trade, Dublin; his subject being "Some Further Experiments on Carbon Monoxide." In the evening the members will dine at the Imperial Hotel, on the invitation of the Directors of the Waterford Gas Company. The next day, they will visit the gas-works, and afterwards go for an excursion to Dunmore and Tramore, and dine in the Grand Hotel at the latter place.

COMMUNICATED ARTICLE.

THE PURIFICATION OF GAS FROM SULPHUR.

By H. Leicester Greville, F.I.C., F.C.S.

The purification of gas from sulphuretted hydrogen is so easily accomplished, and so well understood, that little need be said on the subject. The purification of gas from what is known as "sulphur compounds other than sulphuretted hydrogen," is, however, worthy of some discussion, as the question has recently come to the front in connection with the Crystal Palace District Gas Bill. But before quite dismissing the matter of sulphuretted hydrogen, I should wish to express a very strong opinion that the official test, as at present conducted, is needlessly exigent. Why is it necessary to operate in such a manner as to render it possible to inflict a daily penalty of £50 for the presence of about a millionth part of a grain? Sulphuretted hydrogen is no doubt an obnoxious impurity, and its removal in bulk is comparatively simple and easy; but to purify gas from it to such an extent that its presence could not be detected by a test long enough and strong enough has always been to me a question of doubt.

A form of procedure which would ensure that the public gas supply should be practically free from sulphuretted hydrogen as shown by some less stringent test than that at present in use, would be surely sufficient protection for all purposes, more especially as in combustion the same product—viz., sulphurous acid—is formed as already exists, in comparatively large quantity, as a sequence of the presence of other sulphur compounds. Turning to these "compounds other than sulphuretted hydrogen," it appears to be a debatable question whether there should be a legal limitation to the amount permissible in gas, or whether the Companies should in this matter be allowed to have what might be termed "a free hand." While Sir George Livesey is evidently in favour of the latter course of procedure, a recent letter in the "Journal" from Mr. George Helps* rather advocates that gas companies should endeavour to keep the sulphur at as low a figure as possible. My own opinion, whatever it may be worth, is that some restriction should be made; although whether the present limit might not be somewhat amplified is no doubt worthy of consideration.

I so far agree with Mr. Helps, that, in the combustion of gas charged with an excessive amount of sulphur compounds, there is sometimes a distinct effect of an unpleasant nature. Much would, however, depend on the proportion of gas consumed to the area of any particular apartment, the position and character of the burners, and the ventilation. It is obvious that a single incandescent Kern burner, consuming about 2 feet of gas per hour, containing about 40 grains of sulphur, while affording a light of about 50 candles, would cause much less vitiation than if the same amount of light was obtained from three ordinary flat-flame burners consuming about 25 feet of gas per hour, containing 10 grains of sulphur.

Of the means by which the proportion of sulphur compounds can be practically minimized, there is at present only one method available—viz., by the use of lime more or less sulphided. Performed in a rough-and-ready way, the results are fluctuating and inefficient; but on a well-conducted gas-works, and conducted with careful watchfulness and scientific skill, there is but little difficulty.

It should be remembered that there is a dual aspect of the question—viz., efficiency, and freedom from nuisance. One point cannot be considered without the other. For instance, by a rotation of four lime vessels, the proportion of sulphur may be reduced coincident with purification from sulphuretted hydrogen and carbonic acid; but the process is not under complete control, and necessitates the changing of purifiers for a rise of sulphur, at a time when their efficiency for the other impurities has not been exhausted and the material has not performed its maximum duty, which occasions more or less nuisance on discharge. A rotation of five vessels permits of a better working, but is not altogether satisfactory. The use of limited quantities of oxygen or air mixed with the inlet gas has also been found to produce improved results. But the ideal result in sulphur purification can only be attained by having special vessels for the main purification, from which the gas should issue absolutely free from carbonic acid, and with only a very small proportion (if any) of sulphuretted hydrogen, and separate sulphide vessels for carbon disulphide. I have worked this system for years without failure.

The carbonic acid and sulphuretted hydrogen can, of course, be eliminated in distinct vessels, or due proportions of lime and oxide can be placed in each purifier—the ratio between the two being regulated by the efficiency of the materials and the composition of the crude gas. The composition of the latter at the outlet of each vessel will naturally vary at different times; but the proportions of impurities should be so regulated that the No. 1 or A vessel should have passed crude gas some days before its discharge. This is a wise precaution in order to secure the main efficiency of the lime on carbonic acid, and the minimizing of nuisance. Whatever the charging of these vessels, those devoted to subsequent sulphur purification should certainly contain nothing but lime.

The method of making this efficient may be very briefly described. At a certain stage of purification, and with a proper charging of vessels, the outlet of B, or No. 2, would have a large proportion of sulpuretted hydrogen with little carbonic acid, and the outlet of C, or No. 3, while showing a fairly large proportion of sulphuretted hydrogen, would be free from carbonic acid. Vessels C and D might then be bye-passed, or D only; the gas in either case passing into the clean lime in the sulphide house. The treatment is continued until the sulphuretted hydrogen at the outlet of the vessel, being sulphided, is a distinctly measurable quantity; this being absorbed by a final check vessel. The sulphiding process is best performed by a single operation—that is by the continuous passage of the gas for the necessary period. A less effective vessel is formed if the sulphiding process is intercepted; the explanation being no doubt a question of temperature. The higher this is maintained, the better the result. For this reason, the following conditions should be as nearly as possible conformed to:—

1.—That the sulphiding should be done in the summer months; thus ensuring a favourable condition of temperature.
2.—That the vessels should be protected from the cooling action of draughts.
3.—That the inlet gas should have as high a proportion of sulphuretted hydrogen as can be procured.

After sulphiding, the vessel should be allowed to cool for a day or two before using.

No. 3 condition can be best ensured by so charging the ordinary purifiers, for some time previously, that the sulphuretted hydrogen is well forward in the series in proportion to the carbonic acid. This object can be attained by suitably adjusting the proportions of lime and oxide in charging. Of course, the whole business of preparing sulphiding vessels must be performed "*secundum arte*." But conforming to the conditions I have here briefly sketched, a successful result may be obtained; and I have prepared many vessels during the course of my experience successfully. A purifier of about 28 feet by 36 feet, and charged with six 10-inch tiers of lime, will take up some five tons of sulphuretted hydrogen, and absorb during the course of its working at least three tons or more of carbon disulphide. During its active life, a small quantity of sulphuretted hydrogen is constantly evolved, which may perhaps arise from the slow decomposition of any calcium sulphydrate present. If we assume that the active compound mainly present is hydrated calcium sulphide (CaS,H_2O), every 34 parts of sulphuretted hydrogen put into the vessel would combine theoretically with 76 parts of carbon disulphide to form the sulphocarbonate (Ca_2SCS_2).

Although it is advisable to have three or four distinct sulphide vessels, one only will frequently suffice for practical working; the necessity for employing two in succession being rare. I am now speaking of a constant duty of lowering the proportion of sulphur from about (say) 25 to 32 grains per 100 feet down to about 10 grains. A single vessel such as I have described will, when first used, and for some time afterwards, reduce the sulphur to about 8 to 10 grains on a make of about 3 million cubic feet. As the time contact—that is, the period of reaction—between sulphided lime and carbon disulphide is comparatively slow in proportion to the reactions of the ordinary impurities with lime and oxide, it is advisable to have the sulphide vessels of sufficiently large area to admit of a slow velocity of gas. One really efficient purifier will last for a long time in action—gradually diminishing in its activity with use, but still available for the main bulk of the work, leaving the final reduction to a subsequent and newer vessel. In cases of emergency, passing the crude gas into a lime vessel for some twenty-four hours has been found to partially qualify the lime for sulphur purification; but vessels so prepared are ephemeral in their character.

In works where sulphate of ammonia is manufactured, the sulphiding may be effected by the waste gases arising from the treatment of the gas liquor, without interfering with the usual purification routine, as the outlet of the vessel can be left open to the air; the absorption of the gases by the lime being complete. I once prepared a vessel in this way, which took up 5700 lbs. (2·54 tons) of sulphuretted hydrogen and 27,648 lbs. (12·34 tons) of carbonic acid. This subsequently absorbed 5281 lbs. (2·35 tons) of carbon disulphide. It passed 323 million cubic feet of gas; and on first being put to work, and for some time afterwards, it lowered the sulphur by 17 to 22 grains. In sulphiding by this method, it would be a good plan to admit the gases from the sulphate plant at the top of the purifier. When sulphuretted hydrogen appeared through, the cover could be lifted; the top tiers, which would be mainly carbonate of lime, removed; fresh lime substituted; and the sulphiding process renewed. In this way, a higher charge of sulphuretted hydrogen could be introduced with greater subsequent efficiency on the carbon disulphide.

As to the actual cost of materially lowering the proportion of sulphur compounds in gas, it is a very small item in the total cost of purification. Two properly prepared vessels, of an area of (say) 30 feet by 36 feet, and each containing about 5 feet of lime, should suffice for a year's working on a make of about 3 million cubic feet of gas per diem, and reduce the sulphur from 25 to 30 grains down to 10 or 12 grains. If the vessels are thoroughly saturated with carbon disulphide previous to being

* *ante*, p. 110.

discharged, there is very little nuisance—less, in fact, than often occurs in the discharge of an ordinary vessel worked on the rotation system and charged exclusively with lime.

The ideal system for dealing with carbon disulphide would be its absorption by liquid alkaline sulphides, and subsequent recovery in a liquid form. There is no doubt as to the activity of the polysulphides of ammonium in the direction of uniting with carbon disulphide, as exemplified by the Claus process. The late Professor Heaton made some experiments in this direction; but I do not remember any allusion to the recovery or utilization of any bye-product.

Before concluding, there is no doubt that the introduction of water gas has simplified the question of sulphur purification. I have made several experiments on carburetted water gas by the Referees test, and have only found a few grains per 100 feet. Even this small quantity might have been derived from the surrounding atmosphere, as the tests were made on a gas-works. It has been stated that carburetted water gas may contain an appreciable quantity of sulphur compounds. In such cases, the impurity would probably have been derived from the use of an abnormal hydrocarbon oil containing some organic sulphur compound. Assuming that normal carburetted water gas is practically free from sulphur compounds, its admixture with coal gas would tend to minimize the proportion of sulphur. In this way, 30-grain gas, with one-third of its bulk of water gas, would give a mean of 20 grains. Gas companies employing water-gas plant have in this respect an advantage over those manufacturing coal gas only.

TECHNICAL RECORD.

THE NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Ayr.

[From Our Own Correspondent.]

The Meeting of the North British Gas Managers' Association at Ayr, on Thursday, was not one of the largest which has been held under the auspices of the Association, nor was it one of the longest—the whole proceedings being over shortly after four o'clock, whereas we have seen the members struggling to their feet in such numbers that the President for the time being could not bring the meeting to a close till the dinner hour was already past. Perhaps the size of the meeting was affected by the fact that Ayr is a long distance for a large number of the members to travel, and also by the circumstance that it is only six years since the Association last met there. As explaining the duration of the proceedings, it may be pointed out that the author of the principal paper—Mr. W. Young, of Peebles—was unable to be present; and a similar reason in the case of Mr. P. B. Watson, of Stranraer, led to his paper being held over to next year. There was, in addition, nothing approaching contention in the general business; nor, indeed, was there almost anything which was not purely routine work.

Mr. Myers, of Saltcoats—ever ready with a pertinent suggestion—was responsible for the only extra piece of business which was introduced to the members, when he raised the question of how far the resolution of the Association with reference to standard meter-unions was being given effect to. Anyone would have been in order to have raised the subject; but he was more particularly so, seeing that it was on his initiative that it was originally brought before the Association.

Mr. Young's paper was somewhat strong meat for the members; but seeing that the author was not present, it was the easier not to go into some of the deep problems he indicated. Thus, most probably to Mr. Young's disappointment, there is next to nothing for him to reply to. It was a graceful act on the part of the Association to agree to publish all the papers Mr. Young has submitted to them. The truth is that no one of their number has ever contributed matter of so much value to their proceedings as Mr. Young has done; and it is equally true that—thanks to publication—his works have been of more interest and value to a great many outside the Association than have those of any other member. It may be difficult, even impossible, to arrange for a wider circulation of the forthcoming book than among the members of the Association; but as there are many who will not be entitled to a free copy, but who would yet like to possess one, the subject is worth considering.

The other two papers which were before the meeting were of high average. Mr. Waddell's was the exposition of something new and valuable, and should be looked into. He has given the best solution, as yet, of the question of conveying materials in works which cannot afford the more expensive continuously running machinery. Mr. Keillor's was a paper which must have involved great trouble in its preparation. Its value lies, however, not so much in the information which he gathered and crystallized as to the results of working sulphate plant, as in the narration of his own experiences. These are very striking. After reading them, no manager should have any doubt as to the propriety—even duty—of endeavouring to work up his own residuals. It is a happy circumstance for the gas industry in Scotland that it contains in its ranks a young man of so much promise as Mr. Keillor. He himself is to be congratulated upon coming forward. His public spirit ought to be an example to other of the younger members.

The meeting all over was a very pleasant one. Some well-known faces were missed from it; for which due regret was felt and expressed in the different circles which such gatherings resolve themselves into. Changes are inevitable, however, as time goes on. The fortunate thing, for the Association, is that in its later members there appears to be a continued interest in its affairs—a state of matters which, it is to be hoped, may long continue in such a valuable institution.

General Report.

The Forty-Second Annual Meeting of the North British Association of Gas Managers was held on Thursday last at the Town Hall, Ayr, in the same apartment in which it took place six years ago. Mr. T. Lighbody, of Renfrew, the President for the year, took the chair shortly before eleven o'clock, by which time there was a very fair attendance. This was greatly augmented during the day.

Welcome to the Town.

The President said that, as on the occasion of their previous visit, they had Mr. R. M'Vicar, the Chairman of the Newton-on-Ayr Consumers' Gas Company, to bid them welcome to the good old town; and he was sure he had their permission to invite him to remain and take part in the deliberations of the meeting, if his business would admit of it.

Mr. M'Vicar said he was very pleased indeed to be there that morning; and he thanked them very much for the honour they had done him in asking him to the meeting. The President had just shown him the report of their last meeting in Ayr, and he found that on that occasion he delivered a little bit of a speech. He was sorry that the gentleman who was along with him last time was not there that day; but he had no doubt that there was a satisfactory reason that they had not some of the members of the Committee of Management of the Ayr Company. But in their absence, he thought he might, in their name as well as that of the Newton Company, bid them a most hearty welcome to the good old town of Ayr. Since the Association were last in Ayr, considerable progress, he had no doubt, had been experienced in their particular sphere. He noticed from reports occasionally that everything nowadays seemed to be more and more done from a scientific point of view; and that the results were scrutinized and tabulated, and put down in averages and proportions, and so on, so that everyone could form an idea of his own as to what a certain standard was, and how he himself approximated to it. He thought this was a very good idea. Of course, all towns and all gas-works were not equally situated in the facilities they had for carrying on business; some of them being at a further distance from the coalfields than others. But, taking all things into consideration, he thought it was a very good principle indeed that they should be able to set before them a standard, both as to their results from the coal and the cost of their products. He saw from the report of the last Ayr meeting that the electric light had been introduced about a year before; so that they had now had over seven years' experience of electricity *versus* gas. He did not think that either the Ayr Company or the Newton Gas Company had suffered severely from the competition. There were, as they knew, two Gas Companies in Ayr—one on each side of the river—while the electric light was under the control of the Corporation, who naturally did the best they could to foster it. He did not think they had done the gas industry any particular harm, for the reason that the competition had quickened their activities and made them look out for other channels for their work, and had also made them keener to keep down the expense, so as to be able to reduce the price of gas. He had no doubt that in the future other outlets would be opened up for gas. Probably ten or twenty years hence there would be quite a revolution in the matter of appliances for the use of low-quality gas, and also in the way of heating. He should not be a bit surprised if, ten or twenty years hence, houses were all heated on the American system, and gas were utilized for raising the heating power of water. However, this was in the future altogether. In conclusion, he hoped that the members would not only be able to complete their business satisfactorily, but would also enjoy themselves to the full.

The President said he was sure they were all very much indebted to Mr. M'Vicar for his hearty welcome. He proposed that they should accord him a hearty vote of thanks.

Mr. M'Vicar expressed his obligation for the vote.

Membership and Finance.

The Secretary (Mr. R. S. Carlow) read the annual report of the Committee, which stated that the Benevolent Fund had been drawn upon during the year—a donation of £10 having been granted to one deserving case. No question of great importance

on any special subject, either in regard to the manufacture or distribution of gas, had been brought under the notice of the Committee for consideration. The Secretary's statement with reference to the roll of the Association showed that during the year five ordinary and two extraordinary members were removed by death, and seven members resigned. The total membership was 216—a decrease of 15.

New Members.

The following were admitted to membership:—

Ordinary Members.—Gilchrist, George, Gas-Works, Stewarton; Macdonald, John, Gas-Works, Catrina; Vernon, W. F., Gas-Works, Coupar Angus; Watson, Mountain B., Gas-Works, Auchterarder; Young, Wm. Morton, Gas-Works, Newmilns; Cuthbertson, Thos., Gas-Works, Neilston.

Associate Members.—Orr, R. Dundas, Chemical Works, Falkirk; Webster, John, Dalmarnoch Gas-Works, Glasgow; White, Wm. A., Gas-Works, Kilmarnock.

This raised the membership for the current year to 224—made up of 144 ordinary, 54 extraordinary, 18 associate, and 8 honorary members.

The annual accounts showed that the General Fund amounted to £150 13s. 6d.; the Benevolent Fund to £324 5s. 6d.; the Research Fund to £139 10s. 5d.; and the Excursion Fund to £119 9s. 6d.

Obituary.

The President said they could never hear the list of members read without being brought face to face with the fact that again death had been dealing ravages with their membership. Of the members who had gone over during the year, some were, perhaps, better known than others. Mr. Winton, for instance, was better known to the older than to the younger members. In the case of Mr. James Thomson, of Inverness, his was a personality which was well known at their meetings. He did not think he ever knew Mr. Thomson to miss a meeting; and while he seldom took part in the discussions, there was no doubt that, from the admirable manner in which his works were managed, and the price he sold gas at, he derived no little benefit from attending the meetings. He did not think that any corporation could have paid a higher tribute to his memory than the Corporation of Inverness had done, by appointing his son to his post. Through the death of Mr. Foulis, the Association had suffered a loss which it would be very hard to make up. He was well known all over the world; and his fertile brain had given the gas industry many appliances which were of the utmost importance. His whole aim was to benefit the gas industry. He thought he might say that from the interest which Mr. Foulis took in the introduction of regenerative settings, gas managers were much indebted to him. From his work had sprung many other settings, which had been the means of giving better results in every way. The Association had certainly lost its most prominent member; and if he would be in order, he would move that they send a letter of condolence to the bereaved widow. He would propose the same in the case of Mr. Thomson.

The Research Fund.

Mr. J. Napier Myers (Saltcoats) said it was the custom of the Association for the President to move the adoption of the report, and upon this assumption he seconded the motion. He did so because he wished to say a word or two about the Research Fund. The accounts were all correct, he had no doubt; but in his time the only bit of discharge they showed in the Research Fund was in connection with the subject of the meter-unions. This question had been before them for a good many years. Much labour had been bestowed upon it; a good deal of time had been spent upon it, besides £100 of outlay; and the net result of the work was that they had passed a resolution. He did not object to the outlay if the resolution was to result in uniformity of couplings. He respectfully asked the Committee if they would report to next year's meeting what had been the net result of adopting the resolution, and as to how far it would affect the purpose intended of producing uniformity in the couplings turned out by the meter-makers in Scotland. He could hardly add this to the motion; and he did not put it forward in that light, but rather as a suggestion. He hoped that the Committee would see their way to take up the matter.

The President was sure this was a matter in which everyone was much interested, and that the Committee would be quite willing to bring forward a report next year on the subject. He thought Mr. Myers's point was whether they had done any good, or whether they had introduced another coupling to the gas-meter trade. He might say that the Committee would carefully consider the matter, and bring out the proportion of meters being sold with the standard union against those sold without it. He took it that the report was approved.

The Auditor's Report.

Mr. R. B. Main (Glasgow), the Auditor, said he had pleasure in submitting to them his report for last year. They would find in the General Fund that there was, unfortunately, a decrease. This was owing to exceptional expenditure, which, he was glad to say, was not liable to occur again. The Benevolent Fund was in a very satisfactory position, showing an increase of £17, notwithstanding the fact that the Committee had paid out £10 during the year. The Research Fund was also in a healthy condition, showing an increase of £11. The Excursion Fund was down a little, owing to exceptional expenditure at Perth last year. The funds generally stood much as they did twelve months ago—there being about £2 increase all over. The total amount was somewhere about £488. But for the exceptional expenses, it would have been considerably over £500, which, he thought, was a very satisfactory position for the Association to be in. He had no doubt that next year the funds would reach somewhat over £500. He had very much pleasure in again bearing testimony to the very clear way in which the books and accounts were put before them by Mr. Carlow.

The report having been approved,

The President said he had very great pleasure in asking the meeting to accord Mr. Main a hearty vote of thanks for the trouble he took in connection with the Association.

Telegrams Received.

The Secretary intimated that he had received two telegrams, one of which, he was sure, they would be sorry to hear. It was from Mr. Peter B. Watson, of Stranraer, who was to have read a paper. He had sent word regretting that he found himself unable to attend the meeting, because the construction of a new tank was at a critical point.

Inaugural Address.

The President then delivered his address, as follows:—

Gentlemen,—Allow me to thank you for the honour you have conferred upon me by electing me to preside over your deliberations to-day. Following as I do a long list of Past-Presidents who have shed lustre upon the Association, it is a very difficult matter to keep up to the records of eloquence and usefulness to which you have become accustomed. It is pleasing to know that the industry in which we are engaged is no languishing, second-rate one; but that it is in a more active condition to-day than ever, and still shows power of expansion little thought of when it was brought into being through the inventive genius of a native of this poetical county. I refer, of course, to Murdoch.

Old and crude methods of manufacture have been superseded, and plant and appliances which tend to reduce labour and cost of manufacture have been introduced, thereby conferring a great boon on the consumers, by supplying gas at a price undreamt of even twenty years ago. The question of inclined retorts *v.* horizontals and machinery has little in it that directly concerns the great majority of the members of the Association. But inclined retorts, nevertheless, interest us all for the ready means they furnish of handling a large quantity of material on the gravity system. That they efficiently serve this purpose, there can be no doubt when the material employed is of a suitable nature; and, from what I have been privileged to see of them in works I have inspected, I conclude that the class of coal commonly in use in Scotland—a mixture of cannel and splint—has less inclination to creep than certain classes of caking coals which have a tendency to become plastic during carbonization. In the near future, however, the rival systems of inclines and of horizontals with machinery will receive a fair trial in Scotland, as one system will be in use at one large works and another at another, and everything has been arranged to suit the respective systems. Their merits as gas producers will thus be ascertained, and valuable information will be placed at the disposal of those who are interested in such installations.

What is of greater interest to most of us is a setting of such construction as will carbonize the greatest quantity of coal with the least quantity of fuel, and that at the lowest price per mouthpiece—whether it is of the regenerative type or the simple generator. That there are such settings as meet these requirements is well known, and, thanks to a plentiful supply of suitable material, they have become almost universally adopted, even in the smallest works. That these embrace some improvements over direct-fired settings will be generally agreed. But for larger works, there can be no doubt as to the advantage of the full-depth regenerative settings for economy in fuel, in yield per ton, and in general efficiency of the results obtained.

My opinion on the question of purification is so well known that little remains to be said other than that "that odd fraction of a penny" which we are all striving to save, can often be picked up in this department. The picking up depends, of course, on the treatment the gas has been subjected to before it reaches the purifiers. Therein lies the secret of successful gas purification. Careful washing and scrubbing is essential, so as to reduce the impurities to a minimum.

There has recently been a correspondence in the Technical Press as to cost of purification in small works, and among other questions discussed was that of deep *v.* shallow layers of purifying materials. The use of shallow layers largely depends on the previous treatment of the gas, and also on the quality of the material used. Should the gas have carried forward tarry vesicles through the plant, and the gas enter the bottom of the purifiers, the purifying material will become coated and resist the passage of the gas, thereby causing back-pressure. Another item requiring very careful consideration is the state of the material to be used. This should be of a porous nature, and contain a low percentage of silica, where lime is the only material in use. In the event of oxide being used, it is necessary that it should consist of a fair proportion of fibrous matter. It is also important that the

materials should be of good quality, as this proves cheaper in the end.

On the question of deep *v.* shallow layers of material, I was forcibly impressed the other day on visiting one of the largest works and seeing a purifier filled with one layer of material 40 inches deep. On inquiry, I was informed that back-pressure was unknown. In this case, the gas entered at the top, which secured the advantage that, should the material become hard and caked on the top, the cover can easily be removed and the material stirred up; whereas, when the gas enters at the bottom, and the material becomes caked, the purifier must be emptied before the trouble is overcome, whether the material is entirely fouled or not. The former method is to be preferred.

A careful study of the Crystal Palace District Gas Company's case shows that the chief argument in favour of the cancelling of the purification clauses was based on the fact that 90 per cent. of the gas undertakings of the country are under no restriction as to sulphur. While this may be so, it would be inadvisable to allow it to go forth to the public that the gas supplied is of a less pure nature than heretofore. My own experience with the use of oxide and lime in combination clearly proves that the sulphur compounds are well under the "sulphur clauses;" and further, that the nuisance caused by the removal of the fouled material is so small that the adjoining tenants are seldom aware when a purifier is being cleaned. As a question of cost, it is clearly proved by a reference to the published accounts of various gas companies, that works using oxide have the lowest cost per 1000 cubic feet. The cost at our works is 0·306d.

No branch of our industry has received greater attention than distribution of recent years. Very remarkable has been the development in heating and cooking, by the holding of exhibitions, by personal canvassing, by the opening of show-rooms, where the best class of appliances can be seen in operation, and in some cases by the employment of lady assistants with a knowledge of cookery, who are in a position to give better advice, and who can get nearer the users of such appliances than mere men. Different districts, however, have different requirements in this respect; and I do not think that this branch of our business should be indiscriminately rushed—especially as in many cases the fact of Mrs. Jones having a cooker is inducement enough for Mrs. Smith to secure one also. It is necessary to carefully consider applications, and so prevent unremunerative capital expenditure.

This branch has received greater attention than the lighting portion of our business, which produces the greatest part of our revenue; and care should be taken to show the consumers of gas for light the appliances which yield the maximum lighting value at the lowest cost, and to protect them in some measure from the wiles of the itinerant vendor of cheap and very much inferior appliances. A further advance in incandescent lighting may be looked for by the introduction of a burner from which, with 16-candle gas, an efficiency of 25 candles per cubic foot is claimed. The burner, with mantle, can be bought for less than 1s.

The possibilities of still further developing the outlet for gas are rapidly increasing through the demand for gas for power purposes. It behoves us, therefore, to keep a watchful eye on this matter, so as to meet demands as they arise. These demands will go a long way towards settling the vexed question of high-grade *v.* low-grade gas in Scotland. Let us take a case in which the total gas consumed per annum is 20 million cubic feet, and 20 per cent. is disposed of for heating and motive power, exclusive of stoves, and 55 per cent. of the consumers use incandescent burners. Here 75 per cent. of the gas consumed is practically for heating. If a further demand for 10 million cubic feet per annum were to arise for power purposes, my opinion is that under such circumstances the supply of a 23-candle gas would no longer be a necessity, as the requirements of the majority of the consumers would be better met by a gas of from 16 to 18 candles and a reduction in price. Further, by supplying gas of this lower quality, and at a lower price, the demands for power purposes would be met in such a manner as would enable us to compete successfully with producer gas or electricity; and the 25 per cent. of the consumers who still continue to use flat-flame burners would be induced to use improved appliances to suit the reduced quality, as it would, of course, be in their interest to do. Our first care should be to produce gas of as high a calorific value as possible, compatibly with such an illuminating power as would suit the ordinary requirements.

Attention may be drawn here, with advantage, to the remarks of the late Mr. William Foulis, in discussing the paper on "Coal Gas Standards," read by Dr. Rideal before the recent Engineering Congress.* It is well known that Glasgow took a lead in reducing their illuminating power a number of years ago, not by two candles but by five; and they did not experience the results very many eminent authorities anticipated, but found the change a commercial success—so much so that powers recently obtained permit them a further reduction to 16 candles. Under such circumstances, there is much to be gained and nothing to lose by a general reduction to the lower quality, on the part of the smaller undertakings in manufacturing districts.

An argument used against a reduction in illuminating power is the character of internal fittings. It is said that, in many of the older properties, the fittings have been put in to suit the higher quality, and that they would be inefficient for the lower. But it must be borne in mind that the conditions of supply and demand are now quite changed. Through the almost general adoption of incandescent lighting, the quantity of gas required, burner for burner, is less to-day than ever it was, as it is possible to obtain more light from one incandescent burner than from three flat-flame burners. The general adoption of incandescent lighting, and the smaller quantity required, has in many instances been the cause of a reduction in the sale of gas.

The progress made during the year in street lighting, and the attention paid to intensified lighting and improved burners of various kinds, has maintained the position of gas in the race for supremacy in the lighting of public buildings, open spaces, and public streets. In some of the smaller towns the lighting authorities give an object-lesson to many of the larger towns by having all their lamps fitted with incandescent burners. There are, however, two obstacles in the way of a general adoption of this system in Scotland. The quantity of gas consumed per hour being small, there cannot be any claim of economy under this head; while the lamps in use—not having been constructed to suit incandescent burners—would, to give satisfactory results, require to be replaced by lamps made to suit the altered conditions, and the cost of effecting this change requires consideration. Something might, however, be done to adapt the old lanterns by the use of a hood projecting sufficiently far over the upper ventilator to run off the raindrops and prevent their being blown inside. If the lanterns were fixed on four-legged cradles instead of on two-legged ones, to prevent excessive vibration, this would in many instances reduce the cost of mantles per annum and lead to an improved system of street lighting.

The formation of Local Sections of our Association for commercial work is a matter which requires our earnest and careful consideration. These sections, if formed and worked on true commercial lines, would tend to secure a better market for our residuals, and in some measure check or prevent that excessive competition which has always a tendency to keep down prices. Through the want of an understanding, it is very often the case that coke, in particular, is sent into a district that could quite well be supplied from, and lies to the hand of, the local works, and *vice versâ*. There would thus be a saving of carriage, and better prices would be obtained. I do not suggest for a moment that the Local Associations I propose should be a substitute in any way for the Parent Association, but rather that they should supplement the work of the Association in the direction indicated. A similar system, I understand, works with considerable advantage in connection with an Association across the Border; and the matter is, in my opinion, well worth our consideration.

Mr. Dougall, in his presidential address to the Institution of Gas Engineers, touched on the question of education, as has been customary with a long line of Presidents of various Associations. There can be no two opinions as to the advantage of a good, sound education, both commercial and technical, to the man who contemplates gas engineering as a profession. But there is another side to this question. We must not lose sight of the value of the practical education which can only be obtained by practical experience. Many a brilliant student has become a failure by want of a wide knowledge of human nature, and by lack of the tact necessary to (say) conciliate a fractious consumer. There is one great want that members of an Association such as ours have to contend against, and that is in their being managers of works too small to keep a chemist, or in towns where no higher technical school or laboratory exists. Under such conditions, a manager, if he enters upon his appointment well equipped educationally, finds neither time nor appliances to keep himself posted up; and he will experience, as a rule, more difficulty in getting money spent in fitting up a laboratory than in laying in a stock of tools for manual labour.

The question arises, What benefit does membership of this Association offer to a manager so situated, with a view to future advancement? Has it any "hall-mark" it can offer him? These questions lead me to ruminate on the directions in which efforts might be put forth for the advancement of the aims of the Association and the welfare of its members. There are the questions of the formation of an Advisory Board or Advisory Committee, and of the establishment of a laboratory, or the placing at the disposal of the Board or Committee, and of the members generally, an experimental plant in connection with which (under a duly qualified chemist) weekly, bi-weekly, or monthly demonstrations or lectures could be given. In thinking of ways and means for such a purpose, the Research Fund occurs to one; but this, as it stands, is not sufficient to meet the necessities of the case. How best to increase the income of the fund is a matter that requires consideration. I find from last year's report that one company and one corporation subscribed to the fund; and I am surprised that even this was done, because the rules distinctly lay down that no one is to be admitted to the meetings (other than members) without the consent of the chairman. I consider that this restriction ought to be abolished, and that each company and corporation should be asked to send a representative along with the manager to attend our meetings. If this were done, our boards would be placed in such a position that they could recognize that their interests were in the safe keeping of men capable of devoting energy and technical skill to them, and their presence at our meetings would put us in a position to claim their support in extending the work already done by the Association in their interests. I believe in the policy of the open door; and in support of

* See "JOURNAL" for June 23, pp. 893-97.

my view I may mention that the latest Association of a public nature that has been formed (I refer to the Municipal Tramways Association) has, although only three or four months old, been publicly recognized by the City of Glasgow at its first meeting—a recognition such as this Association has seldom or never received. I do not refer to this point with an eye to the fleshpots, but with a view to obtaining the support of each company and corporation, large and small, who might be induced to subscribe a small sum annually in proportion to the quantity of gas they manufacture. From the income so derived, a retainer could be paid to a capable chemist, who for his retainer and a nominal fee for each sample submitted, or for each consultation held, would report through the Advisory Board to the parties concerned. I am sure some such scheme could be matured and carried into practical operation, and it would go a long way towards smoothing the rough places over which we all have to travel, and place our industry on a better basis for practical application and research.

Comparisons may be odious; but they are made. Standards are made; but are they kept sight of as they should be? This question has been touched upon repeatedly, but no definite proposal has been forthcoming; and there is still an opportunity for further investigation and research. The chief difficulty in establishing a standard of comparison between works is that no two works are working under precisely similar circumstances. But there can be no doubt as to the advantages which would accrue from having many parts of our plant made to standards. Were this done, supplies would be more easily obtained, and at less cost. At present the variety of sizes in (say) retorts, is great; and no stock can be made in advance. There are many other points which could be touched upon in this connection; and advantage might be taken of the subject by some of the younger members, who would find in it matter enough to form instructive and interesting communications. These might embrace the results of the working of the only standard we have been able to arrive at—that for meter-unions.

To be connected with an undertaking which is making rapid progress is always pleasant. I am pleased to say that I have the honour to be connected with one of that character. The progress made at Renfrew during the past nine years is best shown by the following figures:—

	1893-94.		1902-03.
Gas manufactured . . .	11,398,000 c. ft.	..	33,515,600 c. ft.
Coals carbonized	1347 tons.	..	3466 tons.
Average price per ton . .	9s. 8d.	..	13s.
Gas made per ton. . . .	8461 c. ft.	..	9525 c. ft.
Tar and liquor sold per ton	48 gallons.	..	56 gallons.
Coke sold per ton . . .	24 lbs.	..	6 c. 3 q. 23 lbs.
Capital per ton of coal . .	£5 2s. 7d.	..	£5 8s. 4d.
Capital per 1000 c. ft. made	12s.	..	11s. 2d.
Selling price	4s.	..	3s. 4d.

I may mention that one-third shale was used during the year 1893-94. These results show an increase of 194 per cent. in nine years; and to meet the increasing demand, the capital expenditure has been heavy, and a considerable sum has been spent in view of future requirements, which will in a short time yield a splendid return, as we have made arrangements to supply a large quantity of gas for power purposes. I may say that the largest gas-engine in Scotland driven with town's gas will, in the near future, be in our district.

I have purposely avoided touching on the more technical side of our industry, as there will be submitted to you to-day three excellent papers, covering a wide and useful field. Should I have touched on any points that may prove of more than passing interest I will consider myself well repaid.

Mr. J. Wilson (Tradeston), the Past-President, proposed a vote of thanks to the President for his address; and the President returned thanks.

Election of Office-Bearers.

The President announced that, as the result of the ballot, the following had been elected office-bearers for the year:—

President.—Mr. D. Robertson, of Dunoon.
Vice-Presidents.—Mr. J. W. Carmichael, of Barrhead, and Mr. W. B. M'Lusky, of Perth.
Members of Committee.—Mr. W. R. Herring, of Edinburgh, and Mr. A. Yuill, of Dundee.
Secretary and Treasurer.—Mr. R. S. Carlow, of Perth.
Auditor.—Mr. R. B. Main, of Glasgow.

Next Place of Meeting.

It was decided that the meeting next year should be held in Glasgow.

Papers Read.

The reading of papers was then proceeded with. Those by Mr. William Young and Mr. Alexander Waddell, with the discussions thereon, will be found on pp. 298, 303 respectively; while that by Mr. Keillor will appear in our next issue.

The members and friends, including a large number of ladies, dined together in the King's Arms Hotel; Mr. Lighbody being again Chairman. The after-proceedings were of short duration, to enable the company to enjoy a drive to some of the interesting spots in the vicinity. On Friday, a large party went upon the annual excursion, which consisted of a sail up the Firth of Clyde and Loch Long to Arrochar.

REMARKS UPON THE PRINCIPLES INVOLVED IN THE PRODUCTION OF GASES FROM COAL, AND SUGGESTIONS AS TO THEIR APPLICATION IN FUTURE DEVELOPMENTS.

By William Young, of Peebles.

[A Paper read before the North British Association of Gas Managers.]

At our meeting in Edinburgh in 1882, I had the honour of reading before you a paper on "The Fractional Distillation of Coal in Connection with Gas Manufacture." Possibly a more appropriate title would have been "A Suggested Method for the Fractional Carbonization of Coal for the Manufacture of Illuminating Gas, with the Recovery of the Nitrogen contained in the Coal as Ammonia."

Briefly stated, the suggestion then offered consisted in subjecting the coal to a preliminary low-temperature distillation in retorts—vertical if non-coking, inclined if coking, so that the coke could be conveniently dropped by gravitation into lower retorts—in which it was to be treated at high temperatures with a large volume of steam for the recovery as ammonia of the nitrogen which it contained. The products from the low-temperature carbonization of the coal were to be subjected to a fractional cracking-up in supplementary sets of retorts; and the heating of all the retorts was to be effected by the gases produced through the incineration of the carbon of the coke by steam, in order to obtain the ammonia.

It was then explained that the process had been suggested through practical experience in carbonizing shale on a large scale for the production of paraffin oils. There, the shale had been carbonized at a low temperature for oil; and the residue or coke had been incinerated in steam, in order to obtain the nitrogen left in the coke, as ammonia. This process is now employed almost exclusively wherever shale is distilled.

In concluding that paper, I promised to bring the further developments of the process before you on some future occasion; and, as the promise has now attained its majority, it occurred to me that I might take advantage of this year's meeting to fulfil the promise by reviewing the evolution of the processes that have since been brought under our notice, and, if possible, by gathering up lessons for still further developments.

Shortly after the reading of the paper in 1882, Mr. George Beilby and the writer, who were colleagues in evolving the process, discovered that it was not necessary to gasify the carbon in the coal coke in an atmosphere of pure steam by means of heat supplied through the walls of the retort or gasifying vessel; also that the necessary heat for the gasifying process could be obtained by the direct combustion of a portion of the carbon in air, provided the combustion was effected in the presence of a sufficient volume of steam, mixed with the air, to ensure that during the combustion process a large volume of hydrogen was produced, and provided that the atmosphere surrounding the burning carbon was sufficiently large to protect the ammonia, subsequently to its production, from decomposition during the combustion process. In the autumn of that year, we jointly obtained a patent for the practical application of the discovery, for the gasification of coal, slack, or similar fuel, and the recovery of the nitrogen which it contained, as ammonia.

We had not worked long at the process, however, before we discovered that, if it was to be made a commercial success, it would be necessary to conserve or regenerate the enormous amount of heat required to raise the large volume of steam that it was found necessary to employ in the combustion and gasifying process, in order to secure a high percentage of the total nitrogen as ammonia, and that it would be necessary to return to the combustion and gasifying chamber as much as possible of the large quantity of heat which was carried away out of the combustion chambers by the very large volumes of steam and gases. Ordinary methods of condensation and treatment of the products were not suitable; and special arrangements had to be devised for the purpose.

The following extract from the patent specification shows how these objects were accomplished:—

> According to our present invention, we do not subject the coal, peat, or other similar combustible substance to a preliminary distillation, but consume both the volatile and fixed constituents of the coal, or other mineral fuel, in an atmosphere of steam or steam and air, so as to convert the whole, or the greater portion, of the nitrogen into ammonia.
>
> This object we accomplish by taking coal, dross, or other mineral in the state wherein it is ordinarily met with. . . . . And we construct and work the retorts or chambers in which the coal is decomposed so as to cause the volatile constituents of the coal to pass through the coke and be subjected to an atmosphere of steam or steam and air, so that both the fixed carbon and the volatile matter shall be simultaneously consumed and converted into a heating gas, and the nitrogen liberated as ammonia.
>
> The second part of our invention has for its object the economical recovery of the ammonia as fixed ammoniacal salts from the very large volume of gas and steam coming from the decomposition of the coal or other substance in the decomposing chambers. This is accomplished by constructing a chamber of brick or similar material, which will resist the action of sulphuric acid, and as far as possible prevent the escape of heat. This chamber is covered with a sheet of lead to prevent the escape of gas, and it also rests in a trough of lead, to receive the solution of sulphate or other

salts of ammonia produced by the acid, which is either made to trickle over fire-bricks loosely stacked inside the chamber, or ordinary coke may be substituted for the bricks, or the chamber may be left empty, and a spray or shower of acid injected, as described in the provisional specification of George Thomas Beilby, No. 2585, of 1882.

The combustible gases from the decomposing chamber, together with the undecomposed steam, prior to entering the absorbing chamber, are cooled by being made to raise steam, or otherwise only so far as to prevent, or nearly so, the deposition as water of the undecomposed steam which accompanies the combustible gas containing the ammonia, and yet sufficiently low to prevent the volatilizing of the sulphuric acid; and as the walls of this absorbent chamber prevent the escape of heat, the sulphuric acid forms a concentrated solution of sulphate of ammonia, which is drawn off from the lower part of the chamber and transferred to vessels, where the solution is concentrated and the sulphate of ammonia crystallized out in the usual well-known manner.

The third part of our invention has for its object the economical obtainment of the large volume of steam or water vapour necessary to decompose the coal, peat, or other similar substance, and also to measure or ascertain the relative quantities of air to the steam admitted to effect the decomposition.

As is well known, water will not give off vapour or steam in close vessels, under ordinary atmospheric pressure, under about 212° Fahr. But, as is also well known, water will give off vapour into an atmosphere of air at all ordinary temperatures under 212°; the quantity being dependent upon the temperature and pressure.

Now we so construct our condensers that the cooling of the combustible heating gases from the decomposition of the coal, peat, or other substance, together with the undecomposed steam accompanying those gases, shall be made to heat water, and over or through this water so heated is passed the current of air on its way to the decomposing chambers. This air is thus made to take up the necessary quantity of water in the form of vapour; and the relative proportion of air and water vapour is ascertained by means of a thermometer placed in the pipe as it leaves the condensing arrangement, and before passing to the decomposing chamber or retort.

It will be observed that the process for the gasification of the coal then devised was substantially identical in principle with, and anticipated, that which Dr. Mond has since so successfully elaborated. It consisted in, as far as possible, burning and gasifying both the volatile matters and the fixed carbon of the coal in an atmosphere of steam and air; regenerating the high-temperature heat in the large volume of products and steam leaving the producer by transferring to, and pre-heating to a high temperature, the air and steam on its way to the producer, and thereafter absorbing the ammonia from the partially cooled products and steam by means of sulphuric acid, and recovering from the solution so formed the sulphate of ammonia. The lower temperature and latent heat in the gases and steam were subsequently regenerated by utilizing them to charge the air with the steam necessary for use in the decomposing or gasifying chambers.

As you are all aware, Dr. Mond has most successfully elaborated these principles, and made his method of applying them a great commercial success. I believe they are capable of still further elaboration in the direction of producing a gas of higher grade; but even with the low-grade gas at present manufactured at such a low cost, and distributed as produced under pressure, there is no doubt that in the districts supplied it will have a considerable influence on our own higher-grade gas industry.

Before passing from this branch of my subject, it is desirable that your attention should be drawn to what I have reason to believe is (if I may be allowed the expression) a popular scientific error. It has been frequently stated that, in order to obtain as ammonia the combined nitrogen in an organic substance such as coal, it is necessary to burn or incinerate it at a very low temperature, and that the success of the Mond gas process is due to the low temperature at which the process of gasification of the coal is effected. Indeed, at one time Dr. Mond appears to have entertained a similar impression; for in the specification of his 1883 patent he states that, in order to maintain a low temperature in the gas-producer, he loads the air to be used in the gasification of the coal with water atomized by a spray apparatus, instead of using water already converted into steam. In his 1893 patent, however, he says: "I have found that the yield of ammonia can be considerably increased by raising the mixture of air and steam to a temperature of not less than 150° C. before it enters the producer;" and he adopts the same method of pre-heating the air and steam as that described by Mr. Beilby and the writer in their patent of 1882.

As a rule, the great bulk of the nitrogen compounds present in coal are remarkably stable in remaining in some combined form when the coal is heated. As you are aware, quite half of the nitrogen present in the coal is left in the coke, even although the coke has been left in the retort for a considerable time at a high temperature; and the volatile nitrogen, which passes to and becomes basic nitrogenous volatile hydrocarbon compounds, is also extremely stable—so much so that before the nitrogen which these compounds contain can be recovered as ammonia, they must be gasified and decomposed at a very high temperature in a suitable atmosphere of steam.

The obtaining as ammonia of the nitrogen contained in coal is far more dependent upon the constitution and volume of the atmosphere by or in which the combustion or decomposition is effected, than it is upon the lowness of the temperature. The results of practical experience, as well as of experiments, would indicate that the atmosphere in which the coal is consumed or decomposed must contain a considerable quantity of hydrogen, and must be of sufficient volume to shield or protect the ammonia, after its production, from subsequent decomposition. Indeed, with some descriptions of coke from some varieties of coal, it is not even necessary that the carbon should be consumed. Mr. R. Tervet, who was my assistant at the time the subject was being investigated, demonstrated that by passing a large volume of hydrogen through the coke from coal that had been carbonized and kept at a high temperature, the nitrogen which it contained was mainly liberated as ammonia. The time of contact and even the volume of the atmosphere were thus shown to be important factors in obtaining the nitrogen in the coke in the form of ammonia.

While this is the case, however, there is no doubt that the lower the temperature at which the carbonization of the coal and the gasification of the coke can be effected, the smaller is the volume of steam and gases necessary to protect the ammonia after its formation. But, to gasify the carbon of the coal in the producer at a sufficiently rapid rate to make the process a commercial success, it is essential that the method of burning the carbon of the coal should be conducted at a fairly high temperature—a temperature that would at once destroy the ammonia, were it not for the large volume of steam and gases present and passing through the producer.

With regard to the other branch of the subject referred to in my former paper—that of the fractional cracking-up and gasification of the hydrocarbon products produced from the coal at lower temperatures—the progress made has not been as great, and has been of a more fragmentary character. As I believe, however, that it will be one of some importance in the production of gas in the future, I have gathered together those fragments for your consideration, along with the other matters to which I have just referred.

Away back in 1878, in the neighbouring town of Kilmarnock, I had the pleasure of reading before the West of Scotland Association of Gas Managers* some notes I had made on the physico-chemical laws relating to gas manufacture; and, again, at the meeting of this Association held in Perth in 1880, I read a paper entitled "Jottings on the Principles Involved in Gas Manufacture."† In both of these communications, attention was directed to (among other matters) the valuable function performed by the vacant space over the coal in the retorts, in affecting the gasification of the evolved hydrocarbon vapours.

It was explained that heat could be applied in two ways to the cracking-up of those vapours—viz., by their direct contact with heated surfaces, and by radiant heat; and that the effects of heat applied to the vapours in these two ways were very different. It was shown that, when the vapours were brought into direct contact with heated surfaces, they were cracked-up indiscriminately and injuriously; the carbon of their constitution being largely deposited upon the heated surfaces, and the resulting gases having in consequence a lower illuminating power. It was pointed out that, on the other hand, when radiant heat was made to act upon the vapours—as in an empty space over the coals in the retort—the heat and the vapours had what might be described as a selective action for each other; that the more complex the constitution of the vapours the more powerfully did they absorb the radiant heat, and the more strongly did the radiant heat act upon them; and that the more complex vapours were thus gasified selectively, and a better quality of gas was produced. It was further explained that all forms of retorts for the carbonization of shale for the production of paraffin oil in which there was a vacant space over the shale had proved failures and been abandoned, owing to the selective action of radiant heat in gasifying the oil vapours in the empty space; and that, on the other hand, all forms of retorts that had been tried for the production of illuminating gas that had no vacant space over the coal carbonized had equally been failures, owing to the excessive production of tars; also that when attempts were made to gasify the vapours that went to form tars, by passing them through the interstices of a mass of red-hot coke, the process had been equally a failure, owing to the low illuminating power of the resulting gas.

The cracking-up of the tar vapours by radiant heat results in the carbon set free during the gasifying process being in a very flocculent condition, which is attended with the difficulty that the carbon is carried forward in the current of gas, and is deposited in the stand-pipes. In practice, it has therefore been found necessary to adjust the charge of coal in relation to the vacant space, so that sufficient tar may be left ungasified to wash down and prevent trouble from the flocculent sooty deposit. Mr. Isaac Carr, of Widnes, made a meritorious attempt to supplement the action of radiant heat in ordinary retorting arrangements, by providing each setting with a large empty heated duct, through which the gaseous and volatile products were passed. This arrangement had, however, to be abandoned in consequence of the difficulties to which reference has just been made.

At our meeting in Dundee in 1893, I had the honour to read before you a paper, on "The Principles of the Production of Illuminating Gas from Liquid Hydrocarbons," in which reference was made to these previous communications, and there was described a further development of the principle of cracking-up oil and tar vapours by the action of radiant heat. That principle was supplemented by a method of treating these vapours by employing the oils or tars to be cracked-up as scrubbing or washing agents, to absorb the ungasified portions of the cracked-up vapours and to wash back into the retort the flocculent carbon set free by the action of the radiant heat and carried forward in the current of

* See "JOURNAL," Vol. XXXII., p. 715. † *Ibid*, Vol. XXXVI., p. 299.

gases. This method of cracking-up oils and tars has come to be known as the "Peebles Process."

The practical results from the process demonstrated that the principle of cracking the vapours in a fractional manner, by submitting them to the action of radiant heat in a large empty retort, was sound; and that a greater amount of enriching or illuminating value could be got from a given quantity of oils or tars than by any other known means. The working of the process taught us other lessons of great importance. It showed that the presence of an inert vapour or gas greatly interfered with the action of radiant heat; that the diluting action of such vapours required that the walls of the retort should be heated to a higher temperature to give radiant heat of sufficient force to do the same amount of cracking of the oil vapours; and that, as a consequence, the portion of the vapours coming in contact with these excessively heated walls was over-decomposed, and the vapours in the empty space were also decomposed in a manner which reduced the enriching value of the resulting gasified products.

Three years ago, at our meeting in Edinburgh, I had the honour of contributing yet another paper, dealing with "The Principles Involved in the Production of Gas by Different Processes, and their Relative Values," in which the lessons taught us by the Peebles process were fully brought under your notice, and more particularly their bearing upon the modern methods of using water gas in the production of illuminating and heating gases.

That paper being of such recent date, and as I have still more recently drawn attention to the matter in the pages of the "JOURNAL OF GAS LIGHTING,"* it is only necessary that I should briefly refer to the points directly bearing upon my present subject. After drawing attention to the principles involved in the production of water gas by the Dellwik and Lowe processes, and showing that the principle of utilizing the largest possible heat-energy of the carbon of the coke by burning it to carbon dioxide during the blow period had been first used in the Dellwik process, I showed that the principle was not new, but that it was well known and had been for a long time recognized and applied in the working of the Lowe process by Messrs. Humphreys and Glasgow. Attention was next drawn to the fallacy of the oft-made statement that hydrocarbon vapours, such as those from oil and coal, gave higher illumination or enriching value when cracked-up in an atmosphere of water gas than when cracked-up by themselves; and it was stated that those holding these erroneous views had been led to devise methods of applying water gas to the process of carbonizing coal, and to give results which were fallacious, or at least misleading.

After reference to a novel method of carbonizing or cracking-up coal and oil vapours in a revolving or moving gas-producer (which, in passing, it may be stated, is still in operation, doing good work), your attention was next drawn to the relative values of the different grades of gas—their cost of production and cost to the consumer; and the paper concluded by a reference to the method then recently introduced in America of distributing gas under very high pressures as a possible means of modifying the relative values and cost of the different grades of gas.

Having thus rapidly reviewed the laws and principles involved in the production of illuminating and heating gases of different grades which on former occasions I have had the honour of bringing under your notice, we have now to consider how we can most advantageously apply these principles, so as to obtain from the materials employed the largest possible amount of light and heat in the gaseous form, of a sufficiently high calorific power per unit volume to suit the purposes for which we require it.

The process of gasifying coal by burning or decomposing it by a mixture of air and steam in producers (as in the Mond arrangement) is undoubtedly the most economical method of converting the coal into gaseous fuel of low grade. As you are aware, the economy of the process arises from the very small cost for plant and labour required per ton of coal gasified; from the percentage of the contained nitrogen converted into ammonia, which practically covers the cost of the low class of coal used; and from the ease with which the process lends itself to the regeneration of the heat leaving the producer, so as to leave stored up in the resulting gases a high percentage of the heat energy of the coal. The gas produced by the process is, however, of such a low grade that, although excellently suited for heating on a large scale and for motive purposes, it is quite unsuited for our purpose.

To obtain a gas of sufficiently high grade or calorific value per unit volume to pay the extra cost of purification, storage, and distribution, and to suit the purposes for which we require it, it is necessary to separate the products of the combustion of the portion consumed in air, to do the work of carbonizing the coal and to convert the carbon of the residual coke into water gas, from the resulting combustible gases; and the problem we have to consider is how this can be most economically accomplished.

It would appear from the carefully conducted experimental trials, and the results that have been obtained in the practical working of the Dellwik process, that the carbon of the residual coke can, from a purely thermal point of view, be as economically gasified by the Dellwik as by the Mond process. The whole of the valuable nitrogen contained in the coke, instead of being largely recovered as ammonia, is, however, converted into free nitrogen and lost.

By our present method of carbonizing the coal, a very large proportion of the combined nitrogen contained in the coal appears as free nitrogen in the resulting gases, and is also lost. One of the main objects of this suggested process is to recover a considerable proportion of the nitrogen that is at present lost as ammonia.

Although the nitrogen compounds present in coal are very differently constituted in different varieties, and yield different results according to the manner in which the coal is distilled or carbonized and gasified, yet all research and practical observation would indicate that the portion of combined nitrogen eliminated during the carbonizing of the coal is, as it leaves the coal, combined either in the form of ammonia or of basic nitrogeneous hydrocarbon compounds; and it is only when the coal is carbonized at high temperatures that the free nitrogen appears in the gases, and then only (or at least mainly) during the later stages of the carbonizing process. During these later stages, the quantity of hydrogenized gases is so small as to be unable to protect the ammonia after leaving the coal, or to prevent it being cracked-up into free nitrogen and hydrogen, or being decomposed and converted into cyanogen compounds.

The proportion of the combined nitrogen contained in the coal which is thus lost is very large; in the case of many coals it is nearly equal to twice the whole quantity recovered as ammonia under existing conditions. Now, keeping in view the facts we have just been considering, it appears to me that a very considerable proportion of the ammonia cracked-up and lost may be preserved by passing the water gas produced from the residual coke by the Dellwik process through the retorts during the carbonizing process, and, if possible, in gradually increasing quantities as the carbonizing of the coal progresses and as the temperature of the retort and its contents rises. The atmosphere in the retort, being water gas and therefore containing hydrogen, would have the triple effect of shielding the volatile products coming from the coal, including the hydrocarbons as well as the ammonia, from over-decomposition by the heat of the high temperature which it is necessary to employ in order to enable the heat conducted to carbonize the coal resting upon the bottom of the retort within the allotted time; second, it would prevent, or at least very much reduce, the formation of cyanogen and sulphur compounds other than sulphuretted hydrogen, and would thus render the resulting gases easier of purification; and, third, as demonstrated by Mr. R. Tervet, the hydrogen of the water gas would assist in liberating as ammonia some of the nitrogen that would otherwise remain fixed in the coke. With regard to the last-mentioned action of the water gas upon the coke, it might with advantage be continued after the coke has been withdrawn from the carbonizing retorts, by transferring it in the highly-heated condition into large vertical chambers or retorts. These might be placed over the Dellwik producers, and connected in such a manner that their lower ends would discharge the coke direct into the producers, so that the highly-heated products of combustion during the blow period would pass up an annular space surrounding the coke chambers or retort, and keep the contained coke at a sufficiently high temperature to enable the very hot blue water gas, which during the period of its production would be passed up through the large mass of contained coke, to continue, under favourable conditions, its function of eliminating a further portion of the fixed nitrogen as ammonia. The ammonia so obtained could conveniently be directly absorbed from the blue water gas by sulphuric acid.

By such a modification and addition to existing plant, I feel fairly confident (from past experience in such matters) that the yield of ammonia per ton of coal would be considerably increased. With some varieties of coals, it might be double that at present obtained.

Possibly, in the future, both the carbonizing of the coal and the gasification of the resulting coke may be accomplished in a modified form of producer, similar to that suggested; the carbonizing being done in the upper part of the retorting chamber, and the volatile products continuously withdrawn by a positive measuring exhauster.

Having thus carbonized the coal under the protecting influence of the blue water gas produced from the residual coke in a modified Dellwik producer, and by this means obtained a mixed gas of higher calorific value and freer than before from cyanogen and sulphur compounds other than sulphuretted hydrogen, with a largely increased yield of ammonia, it only remains to consider the best method of working up the increased yield of tar that would result from the use of the larger volume of water gas in the carbonizing retorts, and the conversion of this tar into gases or into hydrocarbon vapours sufficiently volatile to be taken up and carried away in permanent diffusion through the mixed gases, and also the addition of such other enrichment as may be required to bring up the grade of the gas when this is necessary.

This would be done by a modified application of the principles of the Peebles process. Instead of carrying the process to the full extent of cracking up the tars into gaseous hydrocarbons and carbon or coke, it would be stopped short when the residues had assumed the condition of pitch—a substance likely to remain valuable so long as in coal-mining a quantity of coal dust is produced that requires to be cemented together to form a fuel.

With this object, the slightly inclined retorts for the fractional distillation and cracking-up of the distilled vapours from the tars would be provided at their lower ends with receptacles for the

*Vol. LXXXII., p. 285.

residual pitch, or with means for its continuous flow into suitable receivers.

The tar to be distilled and gasified would, as usual in the Peebles process, be fed into, and pass down, the stand-pipe and flow along the bottom of the retort at such a rate that in its passage it would be distilled; the more volatile portions would be evaporized; and the residues would reach the lower end as pitch, from which it would be continuously or periodically withdrawn. The vapours distilled from the tars on their passage to the stand-pipe would be subjected to the selective cracking-up action of the radiant heat from the walls of the retort. The cracked-up products, after leaving the retort, would be brought into contact with the mixed coal and blue water gas, by which the portions sufficiently gasified would be carried away, while the portions not sufficiently gasified would be condensed or absorbed by the fresh tars from the coal, and along with these fresh tars would be passed back to the retorts, carrying with them the sooty flocculent carbon, to be passed out at the opposite end of the retorts as a constituent of the residual pitch. The process would thus go on continuously; the cracking-up retorts being only stopped when it was necessary to remove the crust of carbon that would gather upon their inner surfaces.

The quality or grade of gas produced by such a process would, of course, vary according to the quality of the coal from which it was produced. With cannels and coals containing much volatile matters and a low yield of coke, the gas would be of higher grade, possessed of considerable illuminating power even in flat-flame burners. With the ordinary run of gas coals, the illuminating and heating power would be proportionately lower in grade. But, even with ordinary bituminous slack, the gas produced would be of a sufficiently high grade to be quite suitable for incandescent Welsbach mantles, for cooking, for heating, and for the supply of gas-engines. It would at once respond to enrichment if it was desired to confer illuminating power upon it; and the enrichment could be very conveniently done by cracking-up a proportion of oil in the retorts used for the cracking-up of the tar vapours. Or, when cannel coal or shales could be obtained at lower prices, these could be carbonized at lower temperatures, and the resulting tars cracked-up by the Peebles process retorts. The enrichment thus obtained would be easily regulated; and would be of a perfectly permanent character, and would, under present conditions, cost less than ½d. per candle per 1000 cubic feet.

The cost of a gas manufactured on these principles would, of course, largely depend on the cost and character of the coal and other materials employed and the grade of gas manufactured. Under any circumstances, the increased yield of ammonia would be considerable, and with some coals my experience in the past would lead me to expect it would be very large. The value of the pitch that would be obtained would be quite equal to that got for the whole tars obtained by the present method; while the portion of tars cracked would yield a gas of high enriching value. The labour required need not be costly, as a large proportion of the work could be done by machinery or by gravitation, or by both. And the class of coal that could be used for the lower grades of gas would in many cases not cost so much as ordinary gas coals less the price of the coke obtained from them.

Taking all these factors into consideration, it should be possible to produce the different grades of gas, on the suggested principles, at a considerably less cost than at present, and at a cost that would enable them to be supplied to compete on a superior footing with other existing methods of obtaining light, heat, and power.

Had time permitted, I would have liked to have considered with you the subject of the purification of low-grade gas by the larger quantity of ammonia that will be obtained, as a further means of reducing costs. But to do so would extend this paper to inordinate length. I may briefly explain, however, that the principle of the method of decomposing the salts of ammonia present in gas-liquor—liberating the combined gases and leaving the ammonia in solution in the liquor in the caustic state, ready to be re-applied to absorb the impurities from the gas—consists in an inversion of the method for the liberation of the ammonia from the liquor in manufacturing sulphate by the process in use at the Hamilton Gas-Works, as described by Mr. J. Ballantyne at the recent meeting of the Institution of Gas Engineers*—that is, under considerable pressure, instead of under a vacuum. Just as the vacuum favours the liberation of the ammonia from the liquor at a lower temperature, so the influence of great pressure is to retain the ammonia in solution while allowing the higher-tensioned and less soluble gases to escape. Those interested in the subject may be referred to the patent No. 16,052 of 1885.

In conclusion, I have to remark that I fully recognize that had it not been for the former connection between this Association and the subject of my paper, what I have now said would have been more appropriately read before a Southern or Continental Association, where the progress in the use of the lower grades of gas, and in processes for their production, has made, and is making, more rapid progress than with us. The progress is said to be mainly due to the character of the available supply of gas-producing materials; and possibly in many cases that is so. Here in Scotland, and also in America, with large supplies of low-priced high-grade gas-producing materials, the lowering of the power of gas has been, and probably will be, slower; and so long as a large percentage of the gas continues to be used in flat-flame burners, and the relative costs of the different grades of gas, in relation to the prices it is necessary to charge to the consumer in order to cover capital and other fixed charges, remain as at present, it will be to the advantage of the consumer to continue to supply the higher grades of gas. It is not the cost of production, nor the selling price alone, but their relation to each other and the purposes for which the gas has to be used that have to be considered when deciding what grade of gas can be most economically supplied; and taking these factors into consideration, it does not appear that the recent reductions in grades of gas and in prices will be to the immediate advantage of the consumer.

While, however, the higher grades of gas may be the best to supply under present conditions, there is no doubt that the trend of the gas industry, both commercially and technically, is in the direction of manufacturing and supplying a lower grade of gas; and it is quite possible—nay almost certain—that in the future, as illumination by incandescent mantles increases and that by incandescent carbon disappears, the relative cost of the production of gases and their value and cost to the consumer may be so altered (more particularly through the greater technical advancement in the manufacture and distribution of the lower grades of gases) that these grades will become the most economical to supply. I trust that what I have brought under your notice to-day may be helpful in that direction, by suggesting the development of methods of producing economically from coal the largest possible amount of heat energy in the form of gaseous fuel of low grade, but still of sufficiently high grade to suit our purposes. I also hope that my paper may supply those of you who are occupied in smaller works with hints as to how to obtain improved results in the production of the higher grades of gas from the coals you are now using.

[In the regretted absence of Mr. Young, the foregoing paper was read by Mr. James M'Gilchrist, of Dumbarton.]

Discussion.

The PRESIDENT said they had listened with very great pleasure to the reading of the paper. A desire had been expressed by some that there should be a discussion upon it. The author wanted it discussed, if they cared for it; and Mr. M'Gilchrist would be prepared to answer any questions, so far as he could.

Mr. M'GILCHRIST was afraid there was some misunderstanding on the part of the President. He would be very glad to open a discussion; but he would not like to attempt to answer questions that might be raised on a paper such as Mr. Young's. The Association and the gas industry were under a deep debt to Mr. Young, not only for this, but for all the other papers he had contributed. These papers were nothing short of what might be termed a historical connection between the Association and the subject of the paper. Each of Mr. Young's communications had been, so to speak, an evolution of the principles that had been previously brought under their notice. The best evidence, to his mind, that these were sound, and had been carefully wrought out by a master hand, was to be found in their wide application, more particularly in the oil industry and in the Mond process, which was now so much read about. He had no doubt that, as in the past, it would be found that the gas-producing process suggested in the paper just read would form the basis of a further application of the principles in the future development of the gas industry. The papers set forth principles and facts which did not lend themselves readily for discussion. However, Mr. Young would be glad to reply, through the press, to any questions which might be raised in the discussion. To his mind, the only point they could profitably discuss was the principles on which the different grades of gas should have their relative values assessed. He had no sympathy with those who reduced the price of gas and at the same time lowered the quality out of all proportion as regarded value. They simply robbed the consumers, while at the same time posing as benefactors. In talking over the subject with Mr. Niven, of Calcutta, who, unfortunately, had been called to the East again, Mr. Niven suggested that, as a compliment to the author of the paper, the Association might publish the different papers that Mr. Young had from time to time given them. He heartily agreed with the suggestion, because he thought that their friend Mr. Young was the highest authority in connection, not only with their own industry, but with the industry of oil making. He thought that possibly the sale of the book, in published form, would leave a very small charge, if any, to be met by the Association; and he hoped that the Committee would take up the suggestion of Mr. Niven's, which, he thought, would in some way be a compliment to Mr. Young, who richly deserved everything they could give in the way of thanks for the great skill and the great labour he had given, in connection with the subjects that were peculiarly his own.

Mr. D. ROBERTSON (Dunoon) thought that Mr. Young had been very happy in the medium he had chosen to convey his paper before them. Mr. M'Gilchrist had filled the position to perfection. There was one particular passage which, with Mr. M'Gilchrist's permission, he might refer to, and which he thought Mr. M'Gilchrist read with most peculiar appreciation, rolling it, as it were, like a sweet morsel under his tongue—he referred to the passage relating to the illuminating power of gas. Mr. Young's remarks were very appropriate at this time; for it was a great mistake for any corporation or company to reduce the

* See "JOURNAL," Vol. LXXXII., p. 755.

quality of gas in so great a degree while reducing the price in a much smaller degree. It was not at all fair to the consumer, because it was, after all, light which the consumer, was buying, and not gas. The Association should support the suggestion conveyed by Mr. M'Gilchrist. There was no doubt they were very much indebted, as an Association, to Mr. Young. In his opinion, Mr. Young was head and shoulders above any one in Scotland in his peculiar department of gas manufacture; and it would be paying only a just compliment to him that the Association should publish the separate papers Mr. Young had read before them. He was sure they would get much greater benefit by reading them in a concentrated form than they had done in listening to the papers when read. The paper came upon them so suddenly that they could not do it full justice that day. He had to thank Mr. M'Gilchrist for reading the paper; and he thought the Association ought to thank Mr. Young for contributing it.

Mr. A. Wilson (Dawsholm) had also to thank Mr. Young personally for the communication he had put before them, and he thought the Association were highly honoured in having such a paper given to them. As Mr. Young said, perhaps his paper would be more appreciated by a Southern or Continental Association. At the same time, they must take it as an evidence of the high appreciation in which he held their Association, that he had sent the paper there that day. There were a great many points in it which he was sure ought to be discussed. At the same time, they had neither the time nor the ability to discuss them as they ought to be discussed. In pointing the way towards which carbonizing in the future might tend, Mr. Young was, as usual, looking well ahead, and giving them the technical side of the subject in advance. He could bear out what the author had said where he spoke of the value of the radiant heat in giving a better quality of gas. They found this to be the case in the making of their oil gas. They used a large-sized upright retort, and the oil was sprayed into it. In this way, they got the benefit of the radiant heat, and they obtained a really very good result. In smaller works, the same result would not be got. This was probably due to the same reason. They found that when their sprays were not working nicely—when the oil was dropping down to the bottom of the retort, and coming into contact with the heated surface there—they did not get the same results. But when the oil went in in a fine spray, and got vaporized before it touched the side, and then went on to the other vessel where it got gasified—the whole of the work being done by the radiant heat—they got much better results. They obtained from 70 to 80 cubic feet of gas of from 100 to 120 candles of enriching value per gallon, which was certainly a very good yield from shale oil. At the same time, while they obtained very good results from the enriching plant, and in spite of what Mr. M'Gilchrist had said, he still thought that enriching was money thrown away. It was getting out of date; and even Mr. Young himself, if they turned to the end of his paper, had to give in to the inevitable. There was no mistake about it. They would have to come to this lower grade of gas; and the sooner they all faced it, and did their best to bring it about, he thought it would be the better for gas undertakings and consumers. To make a high-grade gas and use it in flat-flame burners, when they could have incandescent burners with low-grade gas, which gave them five or six times the light at less cost, was a waste of energy. The sooner the Association gave up trying to push high-grade gas, and advised everyone to try to get on with the new style, he was convinced that the sooner they would do good work for the whole of the gas industry in Scotland.

Mr. J. W. Carmichael (Barrhead) said that gas managers in the present day seemed to be highly satisfied when they got from 20 to 30 lbs. of sulphate of ammonia per ton of coal; but Mr. Young pointed out that this was only about a third of what was derivable. He understood from the paper that a large proportion of the ammonia might be recovered by introducing water gas into the retorts. Now, that seemed to him to be a bit of a difficulty. He did not know how the retorts would stand it. In a works where they had twenty or thirty retorts working, would they have to introduce the water gas into every one of them? Then Mr. Young went on to say that, as the temperature rose, more water gas must be introduced. This meant that it would require a very expert man to watch the process; and he thought that this, also, was a little objectionable. He supposed that Mr. Young meant, by the introduction of water gas into the retorts, to cool the retorts, and so preserve the ammonia, and catch it up afterwards. In his 1882 paper, he pointed out advantages just the same as he was now advocating; and the question might be asked how it was that gas managers had been so slow in profiting by the views then expressed. No wonder that he said the paper might have been more suitable for a Southern or a Continental Gas Association. The only explanation which came into one's mind was the expense of adding the additional plant, and also the cost of proper supervision of the plant. They would require to employ expert men to watch the temperature and other things. He was sure, however, that they were highly pleased with the paper; and he agreed that they ought to compliment and thank Mr. Young for it, and for all the other most excellent papers he had contributed to the Association. He had no doubt—the thought occurred to him while Mr. M'Gilchrist was reading the paper—that Mr. Young must think they had a considerable amount of Scotch caution about them, seeing they had been so long (twenty-one years), and had done nothing in regard to his former paper. He did not suppose any manager in Scotland had taken up his process, or was trying in any way to recover ammonia in the manner suggested. Mr. M'Gilchrist seemed to him also to emphasize the point about low-grade gas. He was quite in sympathy with what Mr. Wilson said in regard to that; and he would like to ask, What about the information contained in the President's address, about mantles and burners being got for 1s. each? He did not think there was any use at all in keeping up a high-grade gas, when these burners could be obtained for such a small sum.

Mr. A. Waddell (Dunfermline) was sure they were all very much indebted to Mr. Young for having his paper read. Like his friend who had just sat down, it did appear to him that, in the meantime, perhaps, the suggestion was rather complicated; but he did not think they should find fault with it, because he had no doubt that, if it were started, the process might be simplified in some way. He would like those who had spoken in favour of high-grade gas to recall what had been taking place over a number of years, and to ask them if their gas was now what it was before. Could anyone say that it was! Not a bit of it. It was falling down in illuminating power, notwithstanding all that had been said about keeping it up; and it was bound to fall. He did not understand how some kept on crying "Keep up the quality." If they could do it, it was all right; but it was useless to keep on crying "Keep up the quality," when it was all the time coming down. They must face the question as it stood before them. They had Mond gas and the like coming into the field, and a much larger use of gas for cooking, heating, and power. All this made it a piece of nonsense to go on crying to keep up the quality of gas. They would be left a long way behind if they did. They must keep the market; otherwise the plant they had would not be long wanted to supply the high-grade gas which was spoken of.

Mr. W. Ewing (Greenock), like the previous speakers, thought they were greatly indebted to their old friend Mr. Young for his paper. He had stood by the Association for many years, and had given them some very able papers and valuable hints on the making of gas. It was some twenty-seven years since he was associated, as a boy, with Mr. Young in a laboratory at Hamilton, where he carried out some very interesting experiments in connection with the enrichment of gas. Mr. Young had continued on similar lines ever since, and had often contributed valuable information to the North British Association, and, previously, to the West of Scotland Association. In connection with the recovery of ammonia from coal, in 1894 or 1895 he might say he had considerable experience, much on the same lines as indicated by Mr. Young. He had the privilege of designing and erecting a complete plant for the manufacture of gas for heating purposes—practically for the distilling of coal for its bye-products. The process in operation then, as applied, was by the use of superheated steam injected behind the retort. The ammonia recovered was practically what Mr. Young indicated—even more. In some instances as high as 90 lbs. per ton of coal was recovered. It was a large experiment, and was successful, as vouched for by two eminent chemists. He thought that, as time moved along, the process would be in operation in his own works. It was a means of making the best of their residual products; and on residual products would depend, to a large extent, the profits of gas undertakings in the future. The reduction in the illuminating power of the gas was another very important factor in their future success. In his opinion, 15-candle gas was good enough for any purpose. In Scotland, many thousands of pounds were wasted every year owing to the peculiar conditions under which they worked. The sooner they came to realize that 15-candle gas, or even less, should be the standard for all purposes, the better would be the profits of the gas undertakings. They were as yet working only on the outside fringe of gas manufacture.

Mr. D. Vass (Airdrie) said if they looked into the paper they would find that Mr. Young first of all dealt with illuminating gas in its ordinary sense, then followed up with the introduction of water gas, and, finally, dealt with the distillation of tar. Mr. Young claimed that his process would give a great increase in the yield of ammonia; but, of course, the first cost of the plant to be used would be a great consideration. He did not think the method could be adapted to their present forms of retorts; they must be something in the form of a producer—at least of an upright retort. He had no doubt, also, that the increase of ammonia was due to the amount of air that was introduced along with the steam. In blast-furnaces, the nitrogen which was separated from the coal was recovered in a greater degree than in gas-works. Of course, it was generally obtained as a bye-product; but if they came nearer to that form of retort, they would find it as he had said. Perhaps some of the members might give them information as to what was obtained in blast-furnaces. There was another new point which might be adverted to—that was, the washing of the gas by sulphuric acid. Hitherto they had only washed it with ammonia in some form or other; and it was quite a new departure to suggest the washing of it with sulphuric acid. This point was worth considering, and perhaps developing to a greater extent than in sulphate plant in connection with gas making. They would then not have three or four plants to look after, but only one vessel, in which they would make gas, and would also produce pitch and sulphate of ammonia, instead of having to deal with these substances afterwards.

Mr. W. B. M'Lusky (Perth) said his interest had been aroused by the remarks that had been contributed to the discussion. It had occurred to him, in connection with some of the elementary matters referred to in the paper, that it was possible that they might maintain a high-grade gas by giving attention to some of the points enumerated, without increasing the cost to the consumer; and, in any case, if this could be done, there was no necessity why they should rush into low-grade gas simply because it might suit certain places to supply low-grade gas. If they took a case, they had the advocates of high-grade gas selling gas at a comparatively high price, and they could not, for a moment, allow a high selling price to be an excuse, or, in any case, they could not allow the plea for a high-grade gas to be introduced for selling at a high price. But neither could they allow the man who was selling gas at a low price to be maligned, or to be thrown into the category of progressive men, who were reducing the quality of the gas. For example, take the case of a Scotch retort of 25 in. by 14 in. section, charged with 1¾ cwt. of good cannel coal, and drawn in three hours. If they wanted to destroy good material, that was just the line to go upon. But if they wanted to make good gas, then follow Mr. Young's example, fill the retort, drop in the charge heavy, and they would get the very best return from the material used. Again, they might take the case of a manager who said: "Now I use cannel coal; I do not believe in any of your peas, or dross, or nuts, or rubbish," and they found that this man was using a third-class cannel. He did not call that cannel, and he did not call it high-grade gas he got from it. He told them flatly that the man who was using nuts, and who was getting 14-candle gas, could enrich his gas to 18 candles quite well; and he would produce the gas far better than the man who was buying third-class cannel, paying £1 per ton for it, and getting 18-candle gas, for doing which he told them that he was a high-grade gas manufacturer. As a matter of fact, some of them had no photometers, and many of them did not know what quantity of gas was produced from the coal they carbonized. It was just a case of paying a price, and the coal must be good. If a consumer complained, just show him the coal being used. That was no guarantee. His experience was that if they had a setting well heated, and put 3¾ cwt. of coal into a 25 in. by 14 in. retort, and drew in three or four hours, but dropped in the charge heavy and applied a sharp heat, they were sure to get a good result in the shortest time. Another point—he was advocating the manufacture of high-grade gas all the time—taking the cost of a gas undertaking, with fixed charges amounting to possibly from 1s. 7d. to 1s. 10½d. per 1000 cubic feet, they had that to begin with, suppose they did not make gas at all. If they did make gas, the coal bill amounted to 6d. per 1000 cubic feet. What did it matter to the consumer, so far as the price of gas was concerned, whether they made 20 or 30 candle gas? It would only make a difference of 3d. per 1000 cubic feet. Their gross cost, to begin with, would be only 6d. per 1000 cubic feet, and their fixed charges 1s. 10d. He had had fixed charges as high as 2s. 8d.; and at the present time his fixed charges were 1s. 7½d. It did not matter, really, to the consumer, whether the gas was 20 or 30 candles, so far as the cost of material was concerned, because, if they reduced their gas to 14 candles, they could not take off 3d. per 1000 cubic feet. In his case, therefore, it was better to maintain a suitable standard of gas—that was to say, a grade of gas that was suitable for power purposes, cooking, heating, or lighting. They might have another case (and perhaps such cases occurred in Scotland), where the fixed charges were 3½d. per 1000 cubic feet, as in Glasgow, as compared with 1s. 7½d. in Perth. He said that in Glasgow it might be, and probably was, right to reduce the gas to 14 candles, because the consumer participated in a corresponding reduction in price. The cost of coal in Glasgow might be, with the cost of handling, about 1s. 6d. If it could be reduced to 1s., the consumer got his price for gas reduced; while the capital charges remained at 3½d., until the production was increased sufficiently to reduce the fixed charges. It was a very different matter in a provincial town, where it was not possible to force up the output. The result was that the consumer did not get an equal return in the reduction of fixed charges. If it were possible to double the output in the space of five years, in his own case he would have a reduction of 10d. per 1000 cubic feet, not through any ability on the part of those administering the affairs of the undertaking, but purely on account of the increased output. They very often got the price of gas reduced, not on account of any economy effected in the management of the department, but purely on account of the increased business. If this could be done by reducing the price and the quality, then they might give the consumer, five years hence, the benefit which had been provided at the expense of the consumers to-day. That was a larger question, and one which he did not intend to enter into that day; but, in conclusion, he just wished to say that if they were going to argue the question of high-grade *versus* low-grade gas, let them be fair to themselves first, and then to their neighbours, and because they saw the price of gas reduced 1s. per 1000 cubic feet in a neighbouring town, do not let them say "That is bad;" but if they had any doubt upon the point, let them have their coal tested first, and then let them have their gas tested.

Mr. T. Wilson (Coatbridge) said he did not rise for the purpose of discussing the valuable paper of Mr. Young's, because he had had no experience in the methods described. The principles of the paper he fairly understood. He was sure they were all very much indebted to him for bringing the paper before them, and to Mr. M'Gilchrist for reading it. But he was really surprised at what Mr. M'Gilchrist said, in again bringing out his old favourite as to the quality of gas. It was a well-known fact that low-grade gas could be produced and supplied to the consumer much cheaper than high-grade gas. In fact, they had not burners nowadays which would consume a 28 or 30 candle gas; but they got as good a light, and better, with a 14 or 16 candle gas, with incandescent burners, as from 28-candle gas with flat-flame burners. In all modern towns, there would be about 75 per cent of the gas used in cooking, heating, and power purposes, and incandescent lighting. He thought that Mr. M'Gilchrist should really part with that old favourite of his.

Mr. A. Wilson asked to be allowed to say he was sure there were a number of points upon which they would all greatly benefit when they took the paper into their serious consideration, and gave it the amount of attention it so thoroughly deserved. Time, he supposed, would not permit of any of the many other points which were in the paper being taken up; but he would like to say, to put himself right, that, in talking of low-grade gas, what he meant was the gas that could be made practically without enrichment—gas made from the coal which was obtained in the district where the gas-works were situated. He thought this was the most economical gas to make.

Mr. M'Gilchrist said it would be out of place for him to in any way reply to the remarks that had been made in regard to the paper, because it was Mr. Young's paper, and he thought they would be far better served by allowing Mr. Young to reply. Mr. Robertson and Mr. M'Lusky had fully answered those who wished to rush them into low-grade gas. He agreed with what Mr. Wilson said—that it was the coal which lay nearest to their hand they should use; but there were some gentlemen who argued in favour of low-grade gas as if it possessed some virtue. He could easily understand how their friends in the South were right upon the subject, because they used the coal that was to their hand; but in the North they were living in a land where there were millions of tons of rich gas-making material, and he could not understand their using a cheaper gas-producing coal. Maybe it was cheaper, but, at any rate, it was a coal producing a low illuminating power of gas; and they supplied it irrespective of whether it was cheaper per unit, light or no light. This was a point he was very strong upon; and he thought that Mr. Wilson had rightly stated that it was the coal which lay to their hand that they should use. He did not think that there was so very much in the enriching process; but still, the gentlemen who held to high-grade gas, if they could reach the point they aimed at by enriching, he thought they were on the right lines. On behalf of Mr. Young, he had to thank them for the kind words they had used regarding him; and if they had no objection, those remarks could be added to the other papers he had referred to, and, seeing they had received the suggestion so readily, he trusted that the Committee, before many months were over, would be able to have the articles in book form, and issued to the members.

COAL AND COKE HANDLING PLANT AT THE DUNFERMLINE GAS-WORKS.

By Alexander Waddell.

[A Paper read before the North British Association of Gas Managers.]

During the last fifteen years, the introduction of coal and coke handling plant to the larger gas-works has been common; and wherever the former has been well done, the results, I believe, have been so satisfactory that the ultimate adoption of one or other of the various forms, with improvements, will very soon be found in all gas-works having any claim to be modern.

Regarding the handling of coke, especially hot coke, by so-called mechanical means, it is freely admitted that the cost of repairs of the plant is very excessive, being about fifteen times the cost of similar coal plant; and apart from the coke being hot, the gritty nature of it must ever cause much greater wear and tear of the plant, which, together with the breaking of the coke, is sufficient, I fear, to minimize very largely any advantages in economy to be obtained from it, leaving, however, the largely increased facilities that are usually obtained by the introduction of machinery.

While the engineers of so many large works have succeeded in introducing plant with very general satisfaction and economy, in smaller works—say, making less than 200 million cubic feet per annum—this is no longer so easy a matter, as apparatus cannot be erected to handle the materials in smaller works at anything like the first cost of plant for larger ones. Indeed, the writer was asked the same sum to erect coal plant for Dunfermline with 100 million cubic feet make, as had been asked for works of nearly double the size. In such cases this might be expected, because it would often be the same plant that would be supplied to each.

Under these circumstances, it was evident that, for first cost, such plant in our case would form a high capital charge and compare badly with larger works. In dealing with our coal only, this plant would have been employed just a small part of the total

time, yet it was incapable of assisting (say) in the handling of coke or other materials; and when everything was counted, it would not pay for the handling of our coal alone.

Sir George Livesey says, in his recent report on the Nottingham Gas-Works: "I have never wished to be able to say, from the entry of the coal into the works to the exit of the coke, nothing is touched by hand." In my opinion, he cannot be a very sincere economist who feels anxious about such a thing; yet he would be still worse if he could gain by doing and would not.

At the Informal Meeting of Gas Managers in March last year, I mentioned the desirability of taking advantage of rising ground as sites for gas-works—arranging as far as possible for the coal, &c., to be taken in on the high side of works, by rail, cart, or other motor, and the plant so placed as to take the fullest use of the coals falling (say) from trucks into the coal-store, from the store to the hand charging-shoot, and then the coke run from the retort mouthpiece by barrows or trucks into the store, storage-hopper, carts, &c. This arrangement, or some modification of it, still appears to me to afford, when opportunity presents itself, one of the simplest means of handling the coal and coke in gas-works. Its cost would be very small, and in all probability would be met in part by a reduced feu rent on a hillside. The arrangement would place small and medium-sized works in a position nearly equal to the larger ones for cost of plant and carbonizing.

It is true these suggestions do not meet the case of existing works with quite a variety of circumstances. In the case of Dunfermline, our site is flat, and only hand labour was employed. The results, I thought, left a fair field for the introduction of coal and coke handling plant; and, after long-continued and careful consideration, I decided that it was best. I believe that in works such as these, and in those of smaller size, it would be best to deal more or less completely with both coal and coke, and with plant other than the present mechanical elevators and conveyors. The capabilities of the Dunfermline plant are these: To store any coal or put it in the overhead hopper, and with equal ease to convey coal from the store to the overhead hopper; to take coke from the shoot hoppers, resting in the floor of the retort-house, and tip it on to the screen, from which it runs into railway waggons, or first put it into the store, and then on to the screen; and to tip into the cart hopper whatever coke is wanted for local sales in cart or bag. In short, the coal is not touched with the shovel from the time it is conveyed into our siding—whether it has first to be stored, and then put into the overhead hopper, or whether the coke has first to be stored, and then put over the screen.

The plant may be likened to a warehouse of three flats, with 2-feet gauge railways on a level with each. The lower one is to enable the coke to be taken from the shoots in the sunk chamber and in the tunnels, and also the coal from the stores or from the hopper underneath the railway waggons. The middle flat is simply an elevated railway in the coal-store—one line running through the centre longitudinally and another transversely for storing the coal. The longitudinal line is continued through the gable of the coal-store to the coke-store and the cart hopper. The upper flat is also an elevated railway to take the coke to the screen or the coal to the overhead hoppers, which have division-plates every 6 feet, so that the different qualities of coal can be kept separate.

A hydraulic lift is used to take the materials from the lower to the upper levels. Whether coals come to hand wet or do not come at all for a few days, little trouble is experienced, as they can be got with equal convenience from the store. A hydraulic ram placed between the rails is used to tip the coals from the railway waggons; and a hydraulic capstan is employed to shunt the waggons.

The capacity of the overhead hoppers is equal to 36 hours' mid-winter supply; of the coal-store, 1500 tons; and of the coke-store, 1600 tons. The plant is capable of storing 250 tons of coals in ten hours, or of filling the overhead hoppers in five hours; and it can deal with 125 tons of coke from the sunk chamber or the coke-store shoots (including screening) into trucks every ten hours. The total cost was £3200. Taking the sinking fund at 5 per cent. and the interest at 3½ per cent., there is a capital charge for the first year of 3·62d. per ton of coal and coke to be handled.

We have not, in the meantime, full work for our plant; one man per 10-hour shift being more than equal to dealing with all our coal and coke in midwinter. With one man working the plant, the costs are as follows: Storing coal, including tipping from railway waggons, ½d. per ton; raising coal from store or railway waggon hopper to the overhead hoppers, ¾d. per ton; storing coke from the sunk chamber to the coke-store, 1d. per ton; raising coke from the sunk chamber hoppers or the coke-store hoppers to the overhead screen, 1½d. per ton.

I have made an estimate of the cost of handling the coal and coke, from the coal coming into the railway siding to its going into waggons as coke, including capital charges, as follows:—

	Per Ton.
Stokers	10·20d.
Coal, coke, and fireman	2·00
Boiler and engine	2·20
Capital charges	3·62
Total	18·02d.

The above figures are from the experience of the past three months' working; but I should have preferred to be able to give you the actual figures for a full year.

I am indebted to Mr. Bryson, the Manager of the Pumpherston Oil Company, for their labour costs and upkeep of machinery in connection with the handling of shale at their works, from the time it is delivered from the mine until the refuse is deposited on the waste-heap, as follows:—

Wages.

	Per Ton.
Breaker men	0·16d.
Retort chargers	0·51
Retort droppers	0·51
Tip men	0·57
Total wages	1·75d.

Material.

	Per Ton.
Upkeep of haulage chains, roads, and hutches	0·30d.
Do. of engine fans and other plant	0·25
Total material	0·55d.

Expenditure per ton of shale, 2·30d.

I give these figures because they are produced by plant of the same nature as our own, and also because they show what a field there still remains for improvement in the handling of material in gas-works, the greater part of which must be in the form and position of the retorts, to enable the work to be done in some way similar to the above. Undoubtedly the demand is already made for us to give a good supply of gas at a considerably lower rate than has heretofore been thought of; and, as you know, large and influential companies are telling us that if we do not do it they will. I do not look to anything of a revolutionary character coming to our aid. We have only to realize the necessities of the times we live in, and then our trade, with all its experience and interest, is bound to succeed, and to grow in importance as one of the greatest needs of the present day.

Discussion.

The PRESIDENT said he was sure they had listened with pleasure to the paper by Mr. Waddell.

Mr. T. WILSON (Coatbridge) thought it might be due to his bad hearing; but he had missed the cost of coal per ton, without depreciation and interest, if Mr. Waddell gave it.

Mr. WADDELL said he did give it; but he would go over it again. [He accordingly re-read the figures relating to cost.]

Mr. WILSON thought that Mr. Waddell was to be complimented on his paper. He had given them practical results, not the figures of any theory. He was exceedingly sorry that he had been prevented from viewing the plant; but he should take an early opportunity of seeing it. He himself was in a works which were, if not antiquated, certainly not very modern. He had no stoking machinery. He had thought seriously of introducing it; but he was never able to see where the work was being done cheaper than he was doing it. Mr. Waddell, however, had certainly done it cheaper than he had been able to. At Coatbridge he was 8d. per ton more than Mr. Waddell.

Mr. A. WILSON (Dawsholm) thought that the main point in machinery of this construction was the small amount of wear and tear, compared with elevators and conveyors. For a small works to have elevators and conveyors entailed a very large outlay for wear and tear, which added materially to the expense, and also as materially to the work of the manager, in the oversight of it. In this case, wear and tear fell mainly on the boxes and rails—things which were easily replaced. He had had the opportunity of going over the plant; and, taking it altogether, he thought it was very good in working, and, might he say, an original scheme. The way in which it had been adapted made it suitable for coal and coke; one hydraulic lift effecting both purposes. The plant had been put in in an economical manner; and, for the size of the works, he certainly thought it would prove very convenient and profitable. Of course, when an original scheme like this was started, they never got the best results at the beginning. In the winter, when a good deal more was doing, it would be better, because Mr. Waddell had to have a certain number of men at work, whether he had employment for them or not. They hoped to hear by and bye about the year's working; and if it turned out well, it might be an inducement to some to try to do better.

Mr. D. VASS (Airdrie) said he had had much pleasure in seeing the work; and it appeared to him to be very convenient for works such as Dunfermline. The plant worked from a siding which was just a little higher than the retort-house floor; and he would be glad if Mr. Waddell would tell them whether such plant would be suitable for handling coke alone. In his own case, he had only to tip the waggon and he had the contents in the coal-store. The handling of the coke was his difficulty. The railway siding was 20 feet above the retort house floor; and hitherto they had had to cart material in order to get up to the level of their own railway siding. He would like to know what the arrangement would cost for coke alone.

Mr. W. EWING (Greenock) said Mr. Waddell's arrangement had all the appearance of being the simplest and most effective scheme in operation in small gas-works; and the working cost of it, including interest and depreciation, exclusive of water, was 1s. 6d. per ton of coal. This was a very low figure indeed to carbonize a ton of coal at, when they considered the saving of

labour and the ease with which men could manipulate a plant of this description and its continuous progress, as it were, as well as the fact that they could handle both coke and coal with it, and that they could select the coal they wanted. If the coal were stored, they could take it and use it, which enabled them to have dry coal at all times. This was a great advantage, and, he had no doubt, would increase the quality of the gas. One thing for which he admired the plant was its simplicity. The more complicated gas-works were with machinery, the worse were the working results. This had been proved beyond dispute. Machinery as a labour-saver should be used wherever possible—to obviate the arduous work of the retort-house. In the working of coal alone, in many places, it cost as high as 3d. or 4d. per ton. At Hamilton, he introduced a system of high-level tipping from carts. The coal was delivered at 7½d. per ton into the works. It was tipped down on an incline, and men broke it on the way, so that about 1d. per ton broke the coal. He understood the figures given by Mr. Waddell to include the breaking of the coal.

Mr. WADDELL said he did not use coal which required breaking.

Mr. EWING thought this was an advantage, because there was no use in breaking if they could get a coal which did not require to be broken. He would have great pleasure, at a later date, like Mr. Wilson, in paying a visit to Dunfermline, because plant of the description in use there was well worthy of inspection. He had no hesitation in saying that it was a departure on new lines, and on correct lines—the lines of simplifying retort-house work. If they could save the labour in the retort-house, even if they were to pay an extra 3d. or so per ton, let them add machinery; but let them put in that which had the least wear and tear. Most machinery, elevators, and coke-conveyors had a life of only about ten years, and the repairs upon them, as had been said, were very numerous and costly, though, he believed, a firm had recently reduced this, and offered to do it at 7½ per cent. on capital, which was certainly a step in the right direction. No doubt, in large works, hot-coke conveyors were absolutely necessary.

Mr. T. WILSON asked Mr. Ewing to give them his experience of coal-handling plant, as compared with hand labour.

Mr. EWING said he was in the very invidious position of having "to consume his own smoke." His costs at Inchgreen had been greatly reduced by hand labour—by the application of a little "elbow grease." He had now an installation of machinery being prepared which they were hopeful would be of great advantage over the older methods of hand labour.

Mr. W. B. M'LUSKY (Perth) was very pleased to have the opportunity of congratulating Mr. Waddell on the completion of this excellent scheme. He had had the privilege, on more than one occasion, of visiting the Dunfermline Gas-Works, and of seeing the scheme in its inception, in the early stages of construction, and latterly in full working order. As a matter of fact, he had been so taken up with it that he had stopped short with his mechanical appliances at Perth, and, whereas he had one half of the retort-house served with coal breakers, elevators, and conveyor, he found that, in the meantime, with their limited resources, they could not afford to duplicate their machinery. He had therefore put down hydraulic hoists to elevate the coal and coke, with this difference from the plant before them—that they had made provision to serve the plant with power; and they were ultimately to duplicate the present plant, when they thought it advisable to do so. They had done this advisedly. They had very handsome new works; and it was necessary, in doing anything in the way of extension, to keep in view the ultimate resources of the establishment. When he said that the scheme had been adapted to their present case, and was well capable of extension to conform to their future requirements, they would admit that they had paid a very high compliment to Mr. Waddell's scheme. Their system of railways was, of course, quite different They had a high-level and a low-level railway; and it had been necessary, on this account, to have two hoists. They had, however, taken advantage of the low-level connection in this way—that they had erected a double-action jigger screen, and they had put through a tunnel for breeze and coke, in addition to the overhead lines for coke, nuts, or smithy char. In regard to the matter of cost, he might say that they had not got down to Mr. Waddell's figures yet, which might be due to more than one cause. In the first place, they paid their stokers the highest wages in Scotland; in the second, they only worked them fifty hours per week; and in the third, they did not work them very hard. He must admit that he had very good men—they always had good men if they treated them well. They had been very long in the service; and when he said this, they would understand that they could not, within a year or two, unbend a man who had been accustomed to a certain kind of work for a certain time. He could not suddenly adapt himself to new conditions; and probably for this reason their costs were not so low as they might be. At the same time, in December, when their minimum demand was on, they carbonized at 1s. 1d., from the time the truck of coal entered the works till the coke was deposited in the store. This 1s. 1d. did not include the exhauster attendant's wages, nor the cost of loading coke for export. Over the year, their cost for coal stored, including the discharge of coal, and on to the coke bing, was 1s. 8½d., or 2d. less than in the previous year. They used West's machines for charging and drawing; and they purposed quenching in the chamber and loading for export right away, when the hoists were at work.

The PRESIDENT said that, like Mr. M'Lusky and some others, he had had the pleasure of viewing the plant in operation at Dunfermline; and while it might strike one to some extent that it was not a scientific machine, it had the advantage of being a very simple arrangement. He had not yet seen a plant that could handle material as this one could. When Mr. Waddell's back was turned, he asked a man a question; and his reply was that they had no trouble in handling 15 tons in an hour.

Mr. WADDELL thanked the members very much for their appreciation of his paper. When he had had a full year's working of the plant, he should be very pleased to give them all the figures relating to it; and he would be very pleased to see anyone who might come to Dumfermline to inspect it. It was difficult to get mechanical apparatus made which would pay in small works. He did not think it could be done. He did the very best he could to get makers to supply the plant. In regard to hot coke, however, he was told that they could not offer for it at all. He thought that if he had to pay so much for an elevating and coal handling plant, it really would not be worth his while to have it at all. He felt that before it was worth his while to have it, he must have one piece of plant to do all the work; and this arrangement was the outcome. Mr. Vass asked him a question—the only one he had to answer. It did not make any difference at all whether there was a high or a low level siding. It would be all right, provided they could have their coal-hopper sunk in the floor. Then the elevation made up for that. It did not matter much whether their railway was elevated or not. If Mr. Vass should think it worth his while to go in for charging machinery, he would have to raise his coal; and he could quite conceive that a very simple plant of this kind could be put up to deal with the coke, and to run it across into the waggons or into a hopper. It would be a very simple matter to have a hoist and an overhead hopper; and in this case they could use a hand-pump to work the hoist, the expenditure for which might be about £150.

WESTERN (U.S.A.) GAS ASSOCIATION.

The Annual Meeting at Louisville.

(*Continued from p.* 176.)

NAPHTHALENE.

Dr. W. H. Birchmore, of Brooklyn (N.Y.), delivered a lecture on the above subject. He commenced by quoting its properties as described in a recognized work on organic chemistry. Commenting on the observed deficiency between the amount of luminosity per ton of coal as obtained in ordinary working, and that shown to be capable of being obtained by means of a laborator y analysis, he said that, by careful experiment and observation on a particular coal, he found that 65 per cent. of the benzene had disappeared, and that there was more naphthalene than was originally present in the coal. He proceeded to trace the re-arrangement of carbon and hydrogen atoms that takes place when benzene is decomposed with the formation of napthalene, and described an apparatus used for studying the synthetical formation of hydrocarbons. This consisted of two gasholders, condensers, and a combustion tube packed with coke and heated to any desired temperature. One holder being filled with gas, and the other empty, the sample would be caused to travel over the coke at any desired velocity, and could be passed backward and forward any number of times. Naphthalene could be formed in this apparatus by passing methane or several other carbon compounds in contact with the heated coke. The conditions obtaining in such an apparatus were almost exactly the same as those in a gas-works retort. If the apparatus was charged with methane in its usual moist state, the result of passing it through the heated combustion tube was the formation of carbon monoxide, ethylene, ethane, free hydrogen, and carbon; while a considerable proportion remained unchanged. The extent of decomposition depended upon the temperature of the coke; and as this approached a white heat, other members of the ethylene series would be formed, such as propylene, amylene, butylene, and hexylene. The lecturer condemned the usual practice of analysts in stating the whole of the paraffins as methane, and all the olefines as ethylene, and thought that a process of further separation should be adopted. As soon as about 1 inch of carbon in the tube was red hot, ethylene made its appearance; the amount increasing with each passage of the gas through the tube. When more of the carbon was heated, more ethylene appeared, and some of it went to form higher members of the series by simple addition; but the bulk of these higher members was indefinite and never large. When a still greater area of the carbon was heated, a new phenomenon appeared—the formation of benzol; and a further continuation of the process was followed by the formation of naphthalene in considerable quantity. Some of the constituents of coal gas were already locked up in the coal, and only required liberation; but others were the result of secondary action, and probably much of the naphthalene was formed in this manner.

The relations of naphthalene to anthracene and phenanthrene were next considered; and the foregoing facts were then applied to the known effect—that up to a certain working temperature no trouble from naphthalene arose, but that it immediately ensued if

the temperature was exceeded. For the further investigation of this point, the lecturer had used a special form of experimental apparatus, designed to collect not only the gas from the coal, but also the liquids, and in such a manner that they could be examined at leisure. The condenser could be cooled to zero Centigrade; thus effecting the separation of the hydrocarbon vapours. The gases, either before or after condensation, could be passed through a secondary retort or combustion tube as above described. With this apparatus, the coal could be treated in as many as twelve different ways. In this manner, he had, during several years, studied the properties of some 26 different varieties of coal; and certain of his observations had a practical bearing on the naphthalene question. The selection of the coal used was not a negligible quantity; and without naming any particular brands, he might refer to the known fact that some coals gave no trouble and others were the reverse. Gas coals might be classified as follows: (*a*) Containing an excess of naphthalene solvents, (*b*) a saturated solution of naphthalene, and (*c*) an excess of naphthalene. He had observed that small samples were useless for determining the proportion of the substance present. Samples from different parts of the same vein showed a variation of as much as 50 per cent. In another case, a sample contained only 60 per cent. of the quantity found in a second sample of the same brand of coal taken two years later. When, in addition to this, the effects of secondary decomposition were considered, it was easy to see why some regarded naphthaene as a sort of "evil-jin" subject to no known laws.

He thought the gas engineer did not avail himself to a sufficient extent of the services of the analytical chemist, who might with advantage be asked to advise not only as to the percentage of sulphur, but as to the proportion of about 26 other constituents. One analysis was not enough; the supply should be sampled from time to time to make sure that it was up to standard. In his experimental apparatus, the degree of heating was carefully regulated; and he found that, when the products were sent direct to the condenser, the rate or degree of rapidity of heating did not affect the results, except that with the more rapid evolution of gas a larger proportion of naphthalene went forward. In fact, the yield from a given coal was nearly a constant, both as to the quantity and the quality of its constituents. Any difference at first experienced was due to the hot carbon of the charge; and when suitable means were adopted to get the gas away from this influence, the changes were practically reduced to zero. With his small apparatus, he found that, whatever the temperature worked at, the whole of the naphthalene went down with the tar. He tried the effect of hot condensation. Passing the products from the retort through a condenser heated to 105° C., all the naphthalene and 92 per cent. of the benzol went down with the tar; while the light hydrocarbons and some with high boiling points went forward with the gas. The paraffins and olefines seemed to show a tendency to separate from the closed-ring compounds at about 100° C.; and this explained why the light paraffins did not tend to retain naphthalene in the gas. Trying a higher temperature, 140° C., he found that all the benzol went forward, but yet the naphthalene was retained in the tar; and this suggested a rational treatment for the naphthalene nuisance. At a still higher temperature, 175° C., he found that a considerable proportion of naphthalene was carried forward by the gas. If gas thus treated was suddenly cooled to 50° C., the naphthalene was nearly all precipated in crystals; but if the cooling was gradual, much of the naphthalene was retained. Sometimes the naphthalene would be retained to the lowest temperature, but at others it would separate suddenly like a fall of snow. Opinions seemed to differ as to the true solvent of naphthalene that retained it in the tar. The general opinion was in favour of anthracene oil; but some inclined to the isomeric oil, phenanthracene, or phenanthrene, or to a solution of anthracene in phenanthrene. It was supposed that one cause of the naphthalene trouble was the cracking up of these solvent oils in the hot retort. From this, the conclusion might be drawn that it was a direct product of high temperatures. But some of those who believed in this method of working were prepared to deny the existence of such "solvents," or their destruction at high temperatures.

A difficulty here noted was that very few gas engineers used pyrometers, or had a definite idea of the temperature in their retorts. But there was a general consensus of opinion that naphthalene was due to excessive temperatures or light charges. When the whole of the products of distillation were caused to pass through the secondary furnace, great changes were produced. The oils were destroyed to a variable extent, pitch and naphthalene increased, and apparently the increase of naphthalene had a definite proportion to the amount of oil destroyed. As a rule, the benzene increased, but sometimes acetylene, and always naphthalene. This naphthalene was no longer held by solvent oils, and came down anywhere and everywhere. But, as in practical working, a portion of the naphthalene seemed to be held by the benzene. There were two phases of the naphthalene difficulty—one in which sufficient solvent oil was present but could not act, and the second in which the solvent was actually wanted. Oil and gas came from the retort alike as vapours; but, owing to the high boiling point of the oils, they soon condensed and parted from the gas. Custom agreed that the two should be parted as early as possible; and so far he agreed with custom. But they should be subsequently used in a specially designed scrubber to take out the naphthalene, at a temperature somewhat above that at which naphthalene precipitates. The largest possible surface of oil should be exposed to the gas. By this arrangement, the oil entered at the coldest and left at the hottest point—too warm to take up any appreciable quantity of benzene. Between the limits of 80° C. and 218° C., naphthalene was absorbable as a fluid. On this principle, a plan (which he would call *a*) for the removal of naphthalene would consist of the prompt removal of the oils from the gas, cooling the oils to 215° C., and treating the gas with them in a scrubber. A similar plan had been devised by Messrs. Young and Glover in England, and was described in the "Journal of Gas Lighting" for Nov. 11, 1902. He thought these gentlemen had a different series of hydrocarbons to deal with than those usually met with in America, as their observations did not apply to any of the coals he had examined. He rather criticized the chemical part; but approved the engineering of the process.

Another plan was to entirely disregard the solvent power of the residual oils, and to treat the gas with a specially selected oil. It was generally admitted that the proper material for this purpose was anthracene oil—sometimes called green oil; but how to best apply it was as yet undetermined. One important consideration was that of boiling points. Anthracene boiled at 351° C., phenanthrene at 340°, naphthalene at 218°, and benzene at 79°. Taking advantage of these differences, it was possible to separate the first two, and avoid the formation of a confused mixture as "heavy oil." And it must be remembered that these boiling points applied to the pure substance only, and were somewhat modified in mixtures. Returning to plan (*a*), it would be seen that the first condensation separated the heavy oil in a practically pure state; but if allowed to remain with the gas until cooled—say, to 250° C.—this advantage was lost. He showed by experiment that the heavy oil could be removed, and that the subsequent cooling of the gas to 200° C. produced deposition of naphthalene. If the cooling was continued to 70° C., the naphthalene would be either dissolved or frozen out of the gas to a sufficient extent to obviate further trouble; and if it was desired to have the gas actually free from naphthalene, the last traces could be removed by washing with common anthracene oil, specially prepared by adding a certain percentage of benzol. But illuminants would also be removed to such an extent that gas so treated would require subsequent enrichment. It had been objected that such a system would be too complicated for ordinary working; but he could not think that it was impossible to apply a successful laboratory experiment to actual practice. In conclusion, he remarked that he had examined many deposits, but never found one that consisted of naphthalene only. Anthracene and phenanthrene were always present; and it might be that these played an important part in the naphthalene trouble.

Mr. W. E. Steinwedell, in proposing a vote of thanks to the lecturer, said a word might be added as to the removal of naphthalene as practised in about forty European works. Heavy coal-tar oil, to which 3 per cent. of benzol had been added, would absorb naphthalene up to 15 to 40 per cent. by weight. The best way of applying it was in a small two-chamber Standard scrubber—the first compartment charged with fresh oil, and the second with partly saturated oil from the first. The used oil could be safely run into the tar-well. The net cost of this process was about $\frac{1}{8}$d. per 1000 cubic feet of gas. The proper place for this operation was immediately after the removal of the heavy oil by hot condensation; and in small works the oil could be used in a scrubber which would also act as a tar-extractor. The quantity of naphthalene in the oil could be ascertained by fractional distillation. Naphthalene had been successfully removed by passing the gas through sawdust wetted with an alcoholic solution of picric acid; but the cost was considerable.

Gasholder Specifications.

The Committee on Gasholder Specifications submitted a report, in which they stated that the maximum tensile strain should be limited to 13,500 lbs. per square inch of least section of metal in any part. Nothing lighter than No. 12 B.W.G. should be used for sheeting; and it might be desirable to say No. 10. All cup sheets and top and bottom courses should be at least $\frac{1}{4}$ inch thick. Steel plates should be of basic open-hearth steel, tensile strength 52,000 to 62,000 lbs. per square inch, elastic limit at least half the tensile strength, and should stand cold bending on itself without fracture of the outside skin. Particular attention should be given to the first coat of paint.

The Wrinkle Department.

Mr. W. E. Steinwedell, the Editor of the Wrinkle Department, submitted a report. For clearing choked pipes, a burner for heating the pipe externally, connected to the gas supply by flexible tube in such a manner that it could be located at any point, was suggested; also a steam-injector, applied at the top end, to draw a current of air through from the mouthpiece—a clearance having previously been made with a hot bar. Wood might be burnt at the mouthpiece at the same time. Wrought-iron pipe was recommended for the handle and stem of coke rakes, as being lighter than solid rod. Cold water for cooling or for the last scrubber was obtained by pumping from the bottom of the gasholder tank in the summer months. A drip separator for a high-pressure pipe line consisted of a steel cylinder, 30 inches diameter and 8 feet long containing three baffle plates placed with the edges vertical.

A pipe fitted with a cock is attached to the bottom; and when the cock is opened, the pressure drives the condensation out. A coupling for mains laid in rivers or under water consisted of a wrought screw socket, a cast-iron sleeve fitting over it, and leaded on each side, and a rubber ring with an iron end covering ring secured by bolts so as to compress the rubber. A "tunneller" for boring under side walks or other places where the surface should not be disturbed, consisted of a piece of steel with a cutting edge bent into a circle 3½ inches in diameter, with an opening 1¼ inches wide between the ends, secured to a length of 1 inch pipe. Another device, having a similar object in view, was a "pipe forcing jack," by means of which a service-pipe could be pushed or driven through 150 feet of workable earth.

In discussing the "Wrinkles," Mr. Somerville said there was no doubt cold water would take out ammonia; but if it was 25° or so below atmospheric temperature, he thought it would take out something else, and would tend to produce naphthalene troubles. Mr. T. D. Miller said that half-a-pint of dead-oil, poured in at the top, would speedily dissolve any accumulation of pitch in a pipe. He thought the drip separator would be better without the baffle plates, which were not necessary and undesirable. Mr. Goodnow said that the drip separator described was used on a 4-inch line passing 10,000 to 15,000 cubic feet per hour; and it collected about 1 gallon of oil to 12,000 or 15,000 cubic feet of gas and about as much nearly pure water.

(To be concluded.)

THE GAS ENGINE AS A PUMPING MEDIUM.

By D. Hastings Irwin.

[A Paper Presented, but not Read in the Absence of the Author, at the Meeting of the British Association of Water-Works Engineers.]

At the present time, when everyone's attention is rightly turned towards effecting economy at every point, it has occurred to me that a few words on the most economical means of pumping might not be without interest to the members of this society.

The steam-engine has for a long time past been a faithful and well-tried servant; and no matter how unwilling one may be to see an old friend deposed, one cannot shut one's eyes to the fact that its days are numbered, and that, through force of circumstances, it has to give way to the internal-combustion engine. The steam-boiler, owing to its low efficiency, is bound sooner or later to disappear, and with it the steam-engine. The combined efficiency of the steam-engine and boiler can only, under the most favourable conditions, be put down at 14 per cent.; whereas the internal combustion engine can boast of 30 per cent. Here at once is an important saving, deserving of the most careful attention, and which would be a leading factor in estimating the expenses of a projected water supply.

Apart from the great saving in fuel, there are many other advantages which must not be lost sight of. For example, the cost of attendance is less than in the case of a steam-engine and boiler, as is also the upkeep, even when a producer-gas plant is used. Moreover, there are no stand-by losses—no time is lost nor fuel consumed before commencing work when coal gas is used; and directly the duty has been performed, all expenditure of fuel ceases. In the case of oil-engines, and of gas-engines worked by gas from the public mains, all expenses of carting in coal and removing ashes are saved; and the boiler, with its attendant risks and expenses, is absent. No doubt, these points are familiar to most of us; and my only excuse for referring to them is the knowledge that many of us are prone to value too lightly, or to overlook altogether, opportunities surrounding us in everyday life.

It is common knowledge that a good modern gas-engine will give 1 brake horse power with a consumption not exceeding 15 cubic feet of coal gas per hour; an oil-engine will give 1 brake horse power with a consumption of not more than ¾ pint of petroleum per hour; while a gas-engine, working with producer gas, will give the same power with a consumption of coal of only 1 lb. per hour. Taking the average price of coal gas as 2s. 6d. per 1000 cubic feet, petroleum at 6d. per gallon, and anthracite coal at 21s. per ton, or bituminous coal slack at 7s. 6d. per ton, the cost of fuel per brake horse power per hour under the different systems is 0·45d., 0·64d., 0·11d., and 0·04d. respectively.

Having already referred to the steam-engine as being in a moribund condition, one does not like to lay oneself open to the charge of beating a man when he is down; but it must be patent to anyone what an immense saving the internal combustion engine offers over its older competitor. One can, of course, only compare coal gas and oil engines with the smaller class of steam-engine; but when we consider producer gas engines, which can be made practically up to any size, we enter the lists with the larger and more economical type of steam-engine. But here there are few, if any, even of the most modern triple-expansion type, and fitted with all the latest appliances, such as surface condensers, fuel economizers, &c., which year in year out, and under ordinary stoking and working conditions, would average a consumption under 2 lbs. per brake horse power per hour, or just double what a producer-gas plant and engine would consume.

Some eighteen years ago, Sir Frederick Bramwell, when reading a paper before the Institution of Civil Engineers, gave particulars of what had been found to be the actual consumption of fuel of a number of steam-engines tested in Birmingham during an investigation instituted in 1884 by the Corporation, which showed that, on indicating some six non-condensing steam-engines, taken indiscriminately from among users of power, and ranging from 5-horse power nominal up to 30-horse power nominal, the consumption in one instance was as high as 27½ lbs. per indicated horse power per hour; while it never fell below 9·6 lbs., and the average of the whole was as much as 18·1. This is a most surprising, but true, record of the consumption of fuel under ordinary working conditions. No doubt matters have improved since then; but there can be no question that there are a very great number of steam pumping-engines throughout the country that could be advantageously replaced by gas-engines, to the benefit of all.

However, an ounce of practice has been well said to be worth a ton of theory, so it may interest you to hear a few figures recently taken from a plant tested under ordinary working conditions. On Oct. 28, 1902, there was opened at Harrington, in Shropshire, the largest gas-engine pumping plant in this country; and, as far as I know, in the world. It consists of two Crossley gas-engines, each capable of working up to 90 brake horse power, and of lifting 20,834 gallons of water per hour from a well, with a depth of 142 ft. 8 in., through 7615 yards of 9-inch pipes between the well surface and the service reservoir, for the supply of Madeley, with a vertical column of 269 feet, being a total lift from the bottom of well to the overflow level of the reservoir of 412 vertical feet; and, by the interchange of gearing, capable of delivering with the same pumps 14,286 gallons of water an hour from the well, through 5166 yards of 7-inch pipes from a junction with the 9-inch pipes by the Madeley reservoir, with the further vertical column of 74 feet—being a total lift from the bottom of the well to the overflow level of the Broseley reservoir of 486 feet, and through a total length of 12,781 yards of main from the well surface. A single separate pump is fixed in the well, worked by the same engines, capable of delivering (at the same time as either of the before-named quantities) 3000 gallons per hour, through 4100 yards of 4-inch pipes between the top of the well and a service reservoir for the supply of water to the Apley estate and adjacent villages, with a vertical column of 123 feet; being a total lift from the bottom of the well to the overflow level of the reservoir of 265 vertical feet.

During the month of March this year, a series of careful tests was made; and it was found that the amount of fuel consumed was 40 lbs. per hour when lifting to the Madeley reservoir, which shows that the plant works for less than 1 lb. of fuel per brake horse power per hour. The price of the anthracite coal is 25s. 6d. per ton delivered; and of coke for the boiler of the gas plant, 18s. 6d. delivered. One man at 25s. per week is employed, and an assistant at 18s.; and the cost of oil, waste, and grease amounts to 7s. per week. Allowing for 5 per cent. interest on the outlay, and 5 per cent. depreciation, the cost of lifting 1000 gallons of water is only 3·3d.

As an example of the cost of driving a small water-works by means of coal gas, it may be mentioned that at Desborough Water-Works, where a Crossley gas-engine capable of working up to 15 brake horse power is used for driving two sets of three-throw plunger pumps, capable of delivering 25,000 gallons of water per hour 65 feet high, the cost of gas per hour was only 7d.; and this with gas at the high figure of 4s. per 1000 feet. This is equal to 1·92d. per 1000 gallons of water lifted for fuel alone.

At Teignmouth there is a duplicate plant, consisting of two Crossley engines each of 30 brake horse power, and each driving deep-well pumps capable of lifting 13,000 gallons per hour against a vertical head of 180 feet, through 440 yards of 8-inch main, or 3300 gallons per hour 420 feet high through 880 yards of 4-inch main. In 1900, tests were made with a modern steam pumping plant at the Shaldon station of the Teignmouth Water Company, when it was found that it cost 3¼d. per 1000 gallons lifted 200 feet high; whereas the gas pumping plant only cost 3d. per 1000 gallons lifted 400 feet high. This year further tests were made, which showed that the plant raised 1000 gallons 420 feet high for 4½d., including wages and repairs. The present plant replaced an old steam plant, which consumed 25 cwt. of coal in doing work which is now done with 4 cwt. of anthracite.

At Bicton Asylum, near Shrewsbury, the cost of delivering 1000 gallons of water 183 feet high through 430 yards of 4 inch rising main, with gas at 3s. per 1000 feet, has been found to be only 1·23d.; while at Bournemouth water was lifted 200 feet high at 3½d. per 1000 gallons through a mile of 6-inch main.

At the Ross Water-Works, where Dowson gas is used, 120,000 gallons of water are raised 163 feet high in two hours for a fuel consumption of 280 lbs. of anthracite coal in the generator, and sixpennyworth of coke consumed in raising steam in the boiler. The same gas-producing plant is used at the Madeley and Teignmouth works before mentioned; and to Mr. Dowson belongs the credit of making the producer plant the acknowledged success that it is, and to the late Mr. F. W. Crossley that of bringing the gas-engine to its present state of perfection in this country.

At the Cuddington Water-Works, in Cheshire, where one of Crossley's oil-engines and pumps is used for lifting 4800 gallons of water per hour 80 feet high, it has been found that the cost of lifting 1000 gallons of water is only ¾d. for oil for fuel, with oil at 7d. per gallon.

I feel that little more remains for me to say, as I think that the above-quoted costs, taken from actual working results, prove that the internal-combustion engine is *facile princeps* the most economical motive power obtainable—not, of course, considering the turbine, which comes under a different category.

Discussion.

Mr. F. J. Bancroft (Hull) thought the paper a most valuable one as affording to their proceedings the results of pumping by means of the use of gas-engines. There was no doubt that in many cases to put down a steam-pumping plant would entail a heavy expense; and where town gas was available, a cheap installation could not be better provided than by means of the high-class gas-engines that were now on the market; and, failing these, an oil-engine. In outlying districts, the cost of pumping was very considerable, owing principally to the small quantity of water required. Of course, this method of working could not be compared with a triple-expansion steam plant; and it would be extremely unfair to make any such comparisons. But for small installations, the gas-engine, placed in the hands of an engineer an additional tool, if he might so call it, which, in numerous cases, enabled him to carry out work with a success that he otherwise would be unable to accomplish. The paper was indeed an extremely good addition to their transactions.

Mr. William Watts (Sheffield) remarked that a good many years ago he put down one of the old "Otto" gas-engines, of 14-horse power, to supply a little village of between 3000 and 4000 people. The gas-engine pumped water from a concrete tank immediately on the margin of the trunk main, and lifted the water through an 8-inch pipe nearly 200 feet into another concrete tank for distribution. This engine was working to-day very satisfactorily; and it was supplied with gas from the Corporation mains. The man in charge of the village water looked after the gas-engine; and he started it to work when he saw, from the indicator, that the upper cistern required to be filled. He left the engine to itself, and went about his ordinary waterman's business. In this regard and also in the cleanliness of the work, the gas-engine was excellent. This particular engine happened to be under cover, and in the same building in which the concrete tank was built. He believed his memory served him right that it was about 20 feet square by something like 8 feet in depth; and there was no dust or anything of that kind, for the place was kept well secured from any outward pollution. There was no trouble; and it was a very efficient method of pumping under such conditions. He did not now know the cost per 1000 gallons for pumping, but he thought it was about $1\frac{1}{8}$d.

Mr. Henry Preston (Grantham) observed that he was somewhat interested in the internal combustion engine, having adopted the system as an auxiliary plant some ten months ago; and he had therefore looked through the paper with some considerable amount of pleasure. He was pleased indeed to endorse, and he could do so fully, what the author said in the beginning of the paper, that it was a very cheap method of pumping water; and that the cost of attendance and upkeep was very low indeed. One or two of the other points in the paper, he was not so pleased with. The author said that a good modern gas-engine would give 1 brake horse power with a consumption not exceeding 15 cubic feet of coal gas per hour. He (Mr. Preston) thought Mr. Irwin must have taken an extreme case to get that; for a considerable number of gas-engines and records which he had personally examined showed that it was a good engine indeed that would work with anything like 18 to 20 cubic feet per hour. Then again Mr. Irwin made a comparison of the cost of fuel under the different systems. He made it 0·45d., 0·64d., 0·11d., and 0·04d. The 0·64d., representing the oil-engine, he (Mr. Preston) maintained should be 0·56d. Now in regard to the examples given in the paper, these were disappointing. They worked out a little bit high in consumption and cost for internal combustion engines, because he believed many small steam plants could be erected and worked quite as economically as the examples he had quoted. The author had given them the cost of pumping for each particular situation and height. But it would have been more advantageous if he had worked out the cost on some uniform unit. The unit which he thought might have been adopted was per 1000 gallons raised 100 feet, or, if it was thought better, a million gallons raised per 100 feet. A definite unit could be arrived at at any pumping-station; and if the author had adopted this plan, it would have been much more useful for comparison. Some of Mr. Irwin's results he had been able to work out, and he would give them thus. The Desborough case worked out at 0·5d. per 1000 gallons raised 100 feet. Teignmouth worked out at 0·75d. The Bicton Asylum case worked out at 0·67d.; the Bournemouth, at 0·75d.; and the Cuddington, at 0·93d. These were fairly high for the quantity of water raised to the height of 100 feet. The average cost, he thought, worked out at about 0·9d. So far as his own engine was concerned, it was not what they would call a small one. It was a 48 indicated horse power engine; and the horse power at the pump end was just over 26—showing a total efficiency of 54 per cent. The cost of the oil was 0·183d. per 1000 gallons per 100 feet. He (Mr. Preston) had made a considerable number of tests, and might say that this was fairly the cost of oil throughout the whole period. He only tested it again the previous week; and the consumption came out the same. Therefore, Mr. Irwin got an average of $\frac{9}{10}$d. compared with what he might call $\frac{1}{6}$d. for oil. He did not think the author had proved his case to any great advantage.

Mr. Isaac Carr (Widnes) apologized for not being in a position to properly discuss the paper, as he had not had an opportunity of perusing it. The subject was certainly a most interesting one; and he had been very interested in the remarks of the preceding speaker. The gentleman who last spoke referred to the duty obtained from gas-engines, and said that, from his experience, 18 to 20 cubic feet of gas was the result rather than 15 cubic feet. He was a little curious as to the class of gas used in this gentleman's experiments, because if it was water gas (which was very common now throughout the country), it contained 20 per cent. less heating power than coal gas made in the ordinary way; and this might account for the difference between the duty that he obtained and the duty generally realized. He (Mr. Carr) believed Messrs. Crossley Bros., of Manchester, were prepared to guarantee, with the bulk of their engines, a duty of 15 feet per brake horse power per hour. This was, of course, with coal gas; and they made it a condition that it must not be of less than 650 British thermal units per cubic foot. This subject of pumping with gas was one which had occupied his own attention a good deal from time to time, and when it came to surface pumping and forcing, there was very little difficulty indeed in applying it with economy, as the author appeared to set forth. But those of them who were engaged in deep-well work, and who wanted to apply it, would have to do something more in the matter of engineering development before they could apply the system of gaseous fuel to the modern methods of deep-well pumping. Mr. Bancroft had remarked that, as far as economy was concerned, gas could not compare with the modern triple expansion engine. Well, that was a question of degree. If gas made in the most economical fashion was applied as it was made, not only was it equal but it was the most economical way of getting power from coal that was known.

Mr. G. Hodson (Wellingborough) said it was thirty years ago since he first put in gas-engines for pumping; and the engines were doing just as good duty now as when they put them down. He was of the opinion of the last speaker, that the days of the steam-engine for small purposes were getting numbered. Only a week or two ago, he had the pleasure of learning about some large inverted engines that Messrs. Tangye were making for running up to 500-horse power; and they would give a duty that would hopelessly out-distance the steam-engine. A new description of gas, too, was just about being produced—it was not particularly new in Italy, but almost new in England. It was a simple method of producing gas for working engines, and it was called "Dynamic" gas. The apparatus only occupied a few feet of space. There was simply a small round stove, lined with fire-clay; and this was filled with coke or anthracite. On the top of this coke-stove was a little boiler—not exactly for the purpose of making steam, but a kind of water vapour. Hot air was taken from the exhaust of the engine, and passed over water; and the water vapour was then taken down, and sent up through the incandescent fuel. From there, after simply passing through a scrubber or washer, it went direct to the engine stroke by stroke as the engine required it. The cost of the gas was something like half the cost of town gas at 2s. 6d. per 1000 cubic feet. Of course, a greater volume of "Dynamic" gas than town gas was needed, and so the engine must with this gas be made proportionately larger. If this kind of gas was to be used, the economy was something startling. The attention required was next to nothing. As he had said, the gas was merely made stroke by stroke as wanted; and, immediately the engine stopped, the production of gas ceased. There was a little trouble at first in starting it; but directly the heat was got up and a little steam generated, the engine started itself. After that it was simply automatic. The renewals and replacements were remarkably small—simply a fire-clay lining now and then. It had advantages which made him think that, for small plants at all events, the days of the steam-engine were numbered. There was no question about the economy at all. He hoped that at another meeting he would have the pleasure of producing the results of a plant such as he had described, the working of which they were just now about entering upon.

Mr. Carr asked Mr. Preston if he could reply to his question as to the kind of gas he had obtained his experience with.

Mr. Preston said it was ordinary coal gas; and his experience with small engines had not been below 16 cubic feet. He believed that the gas was all coal gas; it was the ordinary gas supplied by the Company.

The recent death is announced of Mr. Alphonse Fteley, a distinguished water engineer in America. Deceased was born in France in 1837, and was educated at the Polytechnic School in Paris; but he left Europe for the United States in 1865, and from 1870 to 1873 was in private practice as a civil engineer. In the latter year, he went to Boston to take charge of the new works for supplying the city with water from the Sudbury River. In 1884, he was called to New York to fill the position of principal Assistant-Engineer to the Croton Aqueduct Commission; and four years later he was appointed Chief Engineer. This post he was compelled to relinquish at the close of 1899 on account of ill-health. Deceased was a member of the American Society of Civil Engineers, and was President in 1898.

AN AMERICAN GAS-ENGINE PUMPING-STATION.

Some particulars were given in a recent number of the "Engineering Record" of a gas-engine pumping-station put up by the Pittsburg Plate Glass Company at their works in Ford City (Pa.). It is located on the Allegheny River, a short distance from the factory; and the arrangement of the plant is such that the supply of water may be secured at any desired depth below the prevailing level in the river, and be clarified by the action of gravity only. The pump-house stands upon the river bank, with its suction pit immediately adjacent to the channel, and sunk several feet below water-level. The foundation of the building on three sides forms a concrete dam 39 feet high on the water front, and tapering from 10 feet thick at the bottom to 4 feet at the top. This wall, in connection with the concrete floors, furnishes a water-tight structure, which will prevent the river water entering the basement. The building is approximately 60 ft. by 80 ft. in exterior dimensions; and the main floor, which is 3 feet above maximum high-water level, is devoted to the power machinery and controlling apparatus for gates and racks, while the pump cylinders and pipe-lines are on the basement, 15 feet below the main floor.

The intake well is divided by a concrete wall into three longitudinal compartments, each approximately 19 feet by 22 feet, and supplying two pumps. The floor of the suction well is 6 feet below low-water level, and 31 feet below high-water level. Water from the river is received in each compartment through four 30-inch cylindrical openings through the abutments, arranged at different levels. Each opening is of sufficient size to let in the full supply of water for the entire plant, and is fitted on the outside with an iron grating, and on the inside with a special sluice-gate, operated by means of a wheel on the floor above. It is the practice to admit water to the suction well only through the intakes which are just below the surface of the water at the then prevailing level. The effect of this is a skimming action; only sub-surface water, which is comparatively free from sand, being admitted. In case the river should be filled with ice or *débris* that would tend to clog the intake gratings near the surface, the next tier immediately below may be used. In the suction well a second skimming takes place.

The station is designed for six pumping units, with an aggregate capacity of 12 million gallons in 24 hours. As natural gas was available upon the premises, gas-engines were selected, resulting in a station arrangement characterized by our American contemporary as peculiarly effective in appearance and operation. Each pumping unit consists of an 85-horse power Westinghouse standard vertical three-cylinder gas-engine, geared directly to a 16 inch by 15 inch single-acting triplex pump. The pump-head or upper works, including the gearing, countershaft, and guides, is located upon the main floor; while the pump cylinders and the suction and discharge pipes occupy the basement. Power is transmitted from the engine to the pump through a friction clutch operated by a hand-wheel at one side. The engines are mounted upon concrete piers extended above the floor level, so as to raise the engine-shaft to a height of 3 ft. 4 in.

DESCRIPTION OF A NEW WATER-PIPE SCRAPING MACHINE.

By C. Clemesha Smith, Assoc.M.Inst.C.E., of Wakefield.

[From a Paper read before the British Association of Water-Works Engineers at Bolton.]

Although the scraping of pipes has been frequently under discussion, yet, as far as the author is aware, none of the machines spoken of have been capable of successfully cleansing pipes of less diameter than 6 inches. Having recently experimented with a new form of machine which will cleanse smaller-sized pipes, the author thinks that a few particulars may be of interest to the Association.

The machine is the invention of a German gentleman, Mr. Nowotny by name; and it has been in use on the Continent during the past two or three years, many long lengths of pipe under 4 inches diameter having been cleansed by it. The machine is made in many different patterns, to suit different classes of incrustation, &c.; but the leading feature running through them all is the turbine, which causes the scraper to revolve at a high speed, and enables the cutters or brushes to remove the incrustation. As to the construction, first there is a swivel hook which will be referred to later. Then there is the swimmer or float, which is made of steel strips, so that it will give slightly to pass any inequalities in the pipes; the spaces between the strips are open at the rear, near the swivel, but closed in the front portion. The front of the swimmer is formed by a disc, in which eight holes are pierced. In front of the swimmer, and connected to it by a universal joint, is the turbine, which is in the form of a steel cylinder, with helical grooves cut on its external face. The turbine is fitted with ball bearings at the back of the bolthead attaching it to the swimmer. The cutters, three in number, are carried in front of the turbine, and rotate with it. They are conical and knife-edged; and revolve freely on their own centres. They have springs behind them, which allow them to give a little to pass slight inequalities in the pipes.

The mode of working is as follows: The requisite hatch boxes having been inserted in the main (at distances varying according to circumstances), the scraper and float are placed in the pipe just beyond the hatch-box. A wire rope is attached to the swivel hook, and passed through a stuffing-box in the lid of the hatch-box, over which is placed a winch on which is wound the requisite length of wire rope. A pressure-gauge is also attached to the hatch-box lid. The lid of the next hatch-box is removed, and the water turned on. As the float entirely fills the pipe, the water passes between the steel strips on the rear portion, but can only escape through the holes in the disc in front, playing directly on the turbine. The turbine revolves at a high speed; and the wheel cutters chip out the incrustation. The water from the turbine passes the cutters, and carries the incrustation down to the open end. The man in charge of the winch pays out the wire rope as required. In some cases it is necessary to work with a brake; but in others, where progress is slow, the scraper is drawn back a little from time to time, to allow the incrustation which has been detached to be washed away. An unusually obstinate piece of incrustation or other obstacle may be removed by drawing the machine back for some distance and letting it go at top speed. Pieces of wood of one-quarter the area of the pipe and about 3 feet long have been pushed by the machine for a distance of over 1000 yards.

The main selected for a trial at Wakefield was 5 inches in diameter, and some 700 yards in length. This pipe was very badly incrusted—indeed, the effective diameter was reduced to 3 inches or less. There were also variations in the level of the pipe; the total rise from end to end being about 30 feet. About three years ago an attempt was made to scrape the main; but after travelling a few yards, the scraper became hopelessly blocked, and had to be cut out, and the attempt was abandoned. The machine used in this case was of a type which has successfully scraped many large-sized mains in this country; but, in justice to the makers, it must be stated that they did not advise that it should be used in this instance, nor for any main under 6 inches in diameter.

For the present experiment, hatch-boxes were inserted into the main about 500 feet apart. The first attempt was unsuccessful; three reasons being assigned: (1) A connection in the main included a short length of 4-inch main very badly corroded, which caused a reduction in pressure when the scraper was at work. (2) The scraper was not quite the right size for the main The first one used, being about $4\frac{7}{8}$ inches in diameter, could not free the whole of the incrustation—the friction stopping the scraper. A smaller one, about $4\frac{1}{4}$ inches diameter, was tried, but allowed too large a volume of water to pass it, and so lost pressure. (3) The corrosion in the pipe was so thick that the water carrying the free corrosion could not travel fast enough, and so set up a back-pressure. In order to remedy these defects, the connection was enlarged to 6 inches diameter throughout. A scraper of an intermediate size was obtained—being $4\frac{5}{8}$ inches in diameter; and arrangements were made to fix a pressure-gauge on the main in front of the machine, so that the amount of back-pressure set up could be ascertained.

When the intermediate-sized scraper was tried, the pressure gauge in front of the machine indicated a back-pressure varying between 15 lbs. and 40 lbs. The pressure at the back of the scraper at this time was 75 lbs., so that the effective pressure varied between 35 lbs. and 60 lbs. A length of some 40 yards of pipe was scraped in one hour; and then the main was cut about 100 yards below the first hatch-box. The pressure in front of the scraper dropped to *nil*, and the speed increased rapidly; the remaining 60 yards being scraped in about fifteen minutes. Between the next two hatch-boxes (Nos. 2 and 3) the scraper jammed on a stone about $1\frac{1}{2}$ inches diameter; and the pipe was cut to take it out. This length being completed, scraping was commenced from hatch-box No. 5. There are eleven ferrules for service-connections between hatch-boxes Nos. 4 and 5; and it was thought probable that the scraper might be stopped by some of them. But no difficulty was met with, the scraper going through without a stop, and cleaning the 500 feet in exactly half-an-hour.

The next length between hatch-boxes Nos. 3 and 4 was more troublesome. Owing to the rise in the main, the loose corrosion was not washed away in front of the scraper very quickly, so that progress was slow. Even in this case, the length of 500 feet would have been cleaned in between two and three hours had the scraper not stuck at what was evidently an uneven joint. Instead of cutting it out, the scraper was put in at the other end of the length, and went through without further trouble.

The incrustation removed consisted chiefly of oxide of iron, and was of a fairly hard nature. A few lumps about 1 inch in diameter were got out; but the bulk was in flakes and scales from $\frac{1}{8}$ to $\frac{1}{4}$ inch across, and about $\frac{1}{8}$ inch thick. No doubt the grinding of the corrosion into small pieces rendered it easier for the water to carry it forward to the open end.

The cost of scraping the main, including labour and materials, amounted to 10d. per lineal yard; but this does not include the royalty on the scraper or the wages of the man working it—the latter being furnished by the company introducing the scraper into this country. The cost of labour and materials is high; but

there is no doubt that, with the experience already gained, the cost of the two items could be reduced to 6d. per lineal yard.

The scraper used in the above case differs slightly from the one described in the early part of the paper. Between the float and the scraper a brush is placed. The cutters on the scraper revolve with the turbine. The main cutters are fixed at right angles to the axis, and have a square face, while smaller cutters are fixed in front at an angle of 45°. The framework of the brush consists of a steel disc at the rear, from which springs a helical grooved ridge running round the shaft to the head. The space between the coils of the ridge is filled with stiff steel bristles fixed at right angles to the axis.

Discussion.

Mr. Isaac Carr (Widnes) asked what the deposit in this case principally consisted of. If it was carbonate of lime, how long did it take to form to the extent indicated in the paper. Also would the author say what was the degree of hardness of the water?

Mr. C. H. Priestley (Cardiff) questioned whether the cost would justify the scraping of mains of such small diameters as 3 to 5 inches. In his own case, they never thought now of using pipes of less than 4 inches diameter for any purpose. There was no doubt, if they used smaller ones, they could not have an effective service for fire; and it was very necessary in laying down mains that they should provide pipes of such a diameter that they would be available in case of fire in large buildings. He should like to know what the cost of the scraping actually would be per yard. Five-inch pipes would cost probably 5s. or 6s. per yard when new; and perhaps it would be better to take out a main after it had been in for several years than to scrape it. If the pipe had been in a great number of years, it would materially reduce the thickness of the metal; and it was a question whether it was the best policy to scrape pipes of such small diameter, or lay new ones. He did not think the Local Government Board would allow money for scraping pipes, but would tell those who applied to put in new ones. However, he was very pleased to hear the result of the scraping at Wakefield.

Mr. T. Kennedy (Kilmarnock) said he had done a great deal of pipe scraping in his time, but it had been with large pipes. They simply put a scraper in, and followed it from the surface by the sound, and generally did about 2 miles an hour—without a rope hanging to it. They could, as a rule, bring the delivery up to the rate of duty of the pipe by passing the scraper once or perhaps twice through. He mentioned an instance at Bradford, in which the pipes were totally corroded up; and even there they did a distance of some 4 miles in about two hours. He never liked to let a scraper go more than 2 miles an hour, as otherwise they were apt to lose it. He also spoke of hand work, and, from his experience of what men could do with a hand cutter, said it cost about 4d. per yard. With the machine described, the work should be done for much less than hand scraping; but it appeared that it was not. He thought it should be done for less than 6d.—2d. or 3d. should be nearer the figure.

Mr. T. W. A. Hayward (Spalding) sought information as to the cost of, or royalty on, the machine; and also as to the wages of the men working it.

Mr. Smith, in reply, said with reference to the nature of the incrustation, the water was a soft one, with a hardness of about 2°. The main scraped had been laid certainly thirty years; how much longer than that he could not say—it might have been 40 years or more. With reference to the size of the pipes, for some time no main had been laid in the district of less than 4 inches in diameter. Regarding the cost of scraping, the figure he had put in the paper of 10d. per yard was the actual cost of labour, apart from the purchase or hiring of the machine. He had no information at present to give as to what the cost of hiring or purchasing the machine would be. The machine was in an experimental stage so far as they were concerned; and he thought the cost of labour—that was, the labour of cutting out the pipes, putting in the hatch-boxes, and other labour of this description—could be reduced to 6d., or under. With respect to the cost of hand scraping, he thought 4d. per yard was a low estimate—that was, if there was very much incrustation in the pipes. The cost of hand scraping long distances on heavily incrustated pipes was very considerable. A few gentlemen who were interested in this matter had been having a little informal discussion among themselves; and the man who gave the lowest estimate put it at 1s. per yard of 4-inch main. There were others present who gave 1s. 6d. or 2s. The pipe Mr. Kennedy referred to must have been one that had not a great amount of incrustation in it.

Suffocation of a Gas Stoker.—A stoker at the Albion Gas-Works of the West Bromwich Corporation met with his death last Tuesday, under somewhat extraordinary circumstances. On entering the engine-house at the works, the doors of which were closed, he must have been immediately overcome by gas fumes, for he was subsequently found lying on the floor dead.

Reductions in Price.—The report of the Stourbridge Gas Committee, which included a recommendation that the price of gas for power purposes should be reduced to 2s. per 1000 cubic feet, was adopted at last week's meeting of the Council. The Ripon City Council have approved of a reduction in the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet, with 7½ per cent. discount where used both for cooking and lighting purposes.

REGISTER OF PATENTS.

Incandescent Gas-Lamp Fittings.—Podmore, A. E., and Thomas, J., of Hatton Garden, E.C. No. 17,806; Aug. 13, 1903.

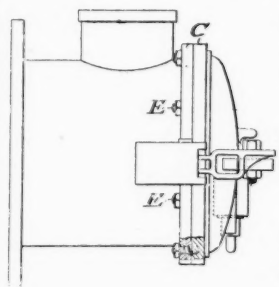
In gas-lamps having two or more incandescent burners fixed on one central stem or pillar, the patentees propose to provide means to give greater facilities of access to the burners for the purpose of cleaning the glass chimneys and renewing the mantles, by making the burners capable of rotation on a central axis without interfering with the gas supply. The burners are fixed to a central hollow shaft or pillar fixed on to, and rising from, a conical-shaped socket, which fits on to a corresponding conical-shaped plug. The socket and plug fit close, and are ground together so as to be gas-tight. The conical shaped plug is fixed to the bottom of the lantern, and forms the base upon which the socket and shaft and burners are revolvable.

In cases where the central hollow shaft is utilized to bring air down to the burners, the gas supply is diverted and made to pass through channels made in the sides of the conical plug and socket, and conveyed thence to the burners by branch pipes.

The burners attached to the central hollow shaft or pillar, may thus be turned round, so that each individual burner is brought opposite the man and operated on as may be required—and this without interfering with the supply of gas to the burners.

Retort Mouthpieces.—Chandler, S. & J., of Brixton, S.W. No. 6676; March 23, 1903.

This invention has for its object to so construct retort mouthpieces that the repairs or re-machining which have heretofore been necessary are obviated. To this end, the patentees provide the mouthpiece with a detachable machined face or ring, suitably secured to the mouthpiece, which, when worn, is easily removed, re-faced, or machined, and replaced, or a new one substituted.



This detachable machined face or ring C is so attached that the cover D of the retort bears against it in the usual way. The machined face is secured by studs, and when the surface of the face of it is damaged, it can be detached by removing the nuts with which the studs are secured in position and replaced, after being re-machined or a new face substituted, with equal facility.

The patentees thus claim to effect "a considerable saving of time and expense, as it has heretofore been necessary to remove the retort mouthpiece and re-machine the face or re-machine the face in position—necessitating letting the retorts down in either case."

Apparatus for Treating Gases with Liquids, for Purifying Gases, and for other Purposes.—Boult, A. J.; a communication from La Compagnie pour la Fabrication des Compteurs et Materiel d'Usines à Gaz, of Paris. No. 18,649; Aug. 25, 1902.

This invention is adapted for the mechanical or chemical purification of (more especially) combustible gases. The different parts of the purifier are so arranged that "the gas treated, in passing through the apparatus, is brought into intimate contact with an 'appropriate liquid,' by which contact it may be desired to obtain either a chemical reaction between the liquid and the gas, or a total or partial solution of the gas in the liquid, or the separation of certain foreign bodies contained in the gas, more especially the dust of the waste gases of high furnaces, the tarry substances mixed with the gases coming from generators, carbonic acid, sulphuretted hydrogen, tar, ammonia, benzol, naphthalene, or cyanides contained in lighting gases."

The illustrations (p. 311) show a longitudinal section of the purifiers, and cross-sections on the lines X, Y, Z.

The apparatus consists essentially of a cylindrical drum which receives rotary movement in the direction of the arrow. The drum is longitudinally divided into a number of radial chambers or compartments, 1, 2, 3, 4, 5, by means of radial partitions. The chambers are filled with any material suitable to divide the current of gas into a number of fine streams, and to retain on its surface the liquid, so as to ensure intimate contact between the gas and the liquid. Wood, in the form of fibre, shavings or chips, laths, leaves, blades, iron shavings or borings, iron plates, coke, slag, and the like might be used according to circumstances.

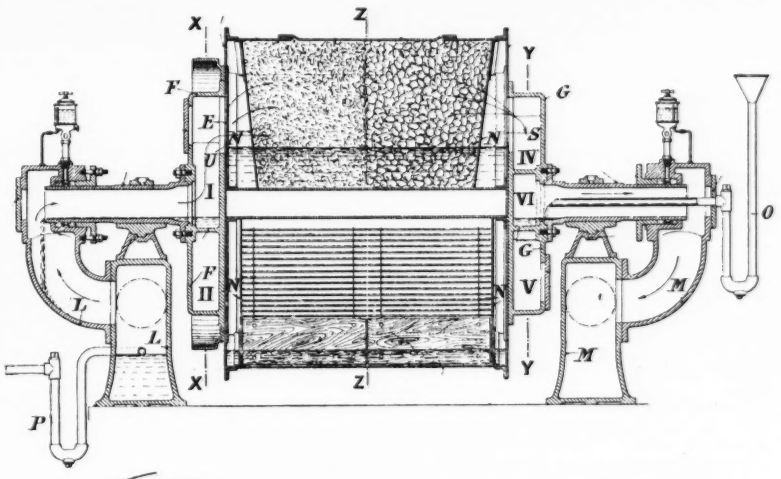
In each of the end walls of the drum opposite to each compartment 1, 2, 3, 4, 5, there are arranged (in circular rows) openings E and S, serving respectively for the admission and the escape of the gas to be treated. The gas-exit openings S are more remote from the centre than the inlet openings E, for a reason which will be explained. The openings communicate with distributing chambers F and G respectively, which are in communication with the hollow journals constituting the rotating axle of the drum, and serving at the same time as the main inlet and outlet conduits for the gas. The journals open into hollow stationary chambers L and M, connected to the main gas admission and discharge pipes respectively. Each drum compartment is closed at the sides by perforated walls N arranged at a distance from the end walls of the drum, so that the openings E and S, through which the gas and liquid pass, are kept entirely free from the contents of the chambers.

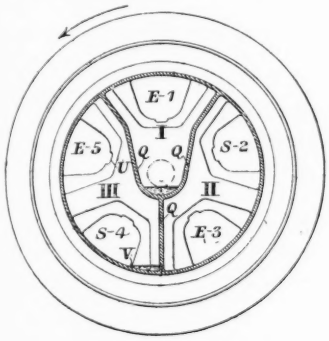
The liquid serving for the treatment or purification of the gas is introduced into the apparatus through a pipe O, and is allowed to escape through another pipe P connected to the lower portion of the hollow

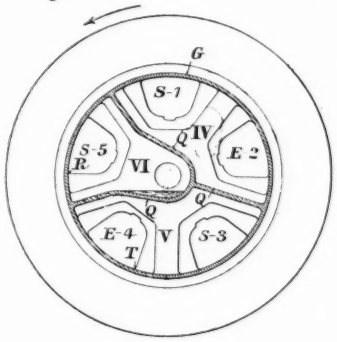
gas-inlet chamber L. To prevent loss of gas, both these pipes are bent into a U shape, so as to form a water seal.

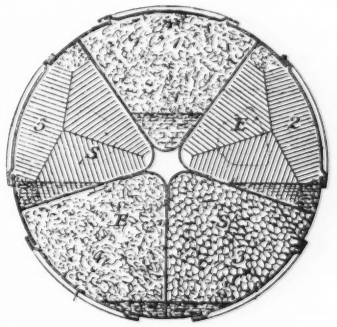
The distributing chambers F and G are divided by inner partitions or walls into a number of compartments—I., II., III., IV., V., VI. The compartments are so arranged with regard to each other that the gas enters the apparatus through the opening E of the first compartment I., passes through the drum compartment, escapes through the opposite opening S into the compartment IV. of chamber G, then enters the compartment 2 of the drum adjacent to the compartment passed just before, and so on, passing in a zig-zag manner through the other compartments 3, 4, and 5 of the drum, to escape finally through the opening S of the compartment 5 into the compartment VI. of the distributing chamber G, and from there into the casing M.

The liquid employed for treating or washing the gas follows the same way as the gas, but in the opposite direction. It is admitted through the pipe O into the compartment VI. of the distributing chamber G, and remains in









this compartment until the opening S of the corresponding compartment 5 of the drum arrives, in consequence of the rotation of the drum, into the position shown by the section on the line Y. When this position is reached, the liquid commences to flow into the compartment 5 of the drum, through the portion R of the opening S of this compartment, which portion is then approximately in the same position as the part T of the opening E of the compartment 4. The liquid flows into the drum compartment 5 gradually as the rotary movement of the drum continues, and is finally completely introduced into the compartment when the centre-line of the opening reaches the position marked.

Owing to the V-shaped form of the drum compartments, the liquid will escape from the compartment 5 when the latter assumes the position occupied in the drawings by compartment 1. To ensure the escape of the liquid through the opening E, it will therefore be sufficient to arrange the portion U of the opening E in suitable proximity to the centre of the drum—that is to say, to arrange the portion U of the opening E nearer to the centre than any other part of the opening S. At each rotation, a quantity of liquid, equal to the amount introduced when the compartment 5 was in the opposite position, will therefore escape over the edge U of the opening, and will fall into the compartment III. of the distributing chamber F. In this compartment it remains until, in consequence of the continued rotation of the drum, the opening S of the compartment 4 assumes the position shown in the section in the line X. In this position of the drum, the liquid begins flowing into the compartment 4 through opening S until the point V. of the opening S comes into the vertical axis. The whole of the liquid in question thus enters the compartment 4 adjacent to the compartment 5, from which it had issued.

The same operation is now repeated in the compartment 4, in exactly the same manner as it took place in the compartment 5. The liquid, owing to the above-described arrangement of the openings E and S, is forced to escape through the opening E opposite to the admission opening S, and the whole circulation of the liquid through the apparatus is so continued in a zig-zag manner until the liquid escapes from the drum compartment 1 into the compartment I. of the distributing chamber F, and therefrom into the casing L, and through the syphon-tube P to the outside.

Several different materials are represented which might be advantageously used in the apparatus. The compartment 1 is filled on the one side with iron borings or shavings, as well as compartment 4, and on the other side with coke or slag, which also forms the filling of compartment 3. The compartments 2 and 5 are filled with small laths or bars maintained at suitable distances apart from each other by means of a frame. The contents of each compartment may be easily removed and inspected from outside by means of doors arranged on the circumference of the drum O. In a similar manner, each compartment of the distributing chambers F and G is accessible from the outside by removing a cover, whereby cleansing is greatly facilitated.

APPLICATIONS FOR LETTERS PATENT.

15,966.—Fielding, J., "Gas-producer." July 20.

15,982.—Schott, O., "Perforated lamp-glasses." July 20.

16,005.—The Otto-Hilgenstock Coke-Oven Company, Ltd., "Recovery of bye-products in processes of destructive distillation." A communication from Dr. C. Otto and Co. July 20.

16,032.—James, R. W., "Gas and oil engines." A communication from A. A. Low. July 20.

16,057.—Bell, R., "Oil and gas engines." July 21.

16,116.—Wilton, T., "Slide-valves." July 21.

16,130.—Lines, R. C., "Making and using hydro-carburetted air." July 21.

16,161.—Atkinson, R. W., "A gas-light motor or revolving gas-light." July 22.

16,164.—Duff, A. B., "Gas-producers." July 22.

16,172.—Mallol, J., "Gas blow-pipes." July 22.

16,176.—Holfert, M. W., "Acetylene gas-generators." July 22.

16,199.—Cargill, T., "Controlling pumps used for compressing or exhausting gas." July 22.

16,235.—Blakiston, R., "Liquid meters." July 23.

16,243.—Duff, A. B., "Gas-producers." July 23.

16,254. - Brown, C. J., "Steam, gas, and oil engine." July 23.

16,263.—George, J. R., "Gas-producers." July 23.

16,336.—Chilcott, T. R. R., "Gas-engines." July 24.

16,345.—Howorth, F. W., "Steam or gas turbines." A communication from the Aktiengesellschaft der Maschinenfabricken von Escher Wyss and Co. July 24.

16,355.—Mossig, M., "Portable gas-generators." July 24.

16,398.—Sharp, J., "Fluid meters, motors, and pumps." July 25.

16,401.—Crossley, W. J., and Atkinson, J., "Internal combustion motors." July 25.

16,407.—Ehmann, C. P., and Morton, F., "Gas lighting torch." July 25.

16,409.—Ravinson, M., "The unbreakable incandescent mantle." July 25.

16,413.—Kelly, J. H., "Rendering swivelling kitchen gas-brackets adaptable for incandescent lighting." July 25.

16,429.—Price, H. A., and Turner, F. W., "Gas cooking-stoves." July 25.

16,434.—Grund, G., "Chimneys and globes for incandescent burners." July 25.

16,448.—Wasmuth, A., "Holder for incandescent mantles." July 25.

Improved Lighting for Whitehall.—At the meeting of the Westminster City Council, on Thursday, tenders were received for improving the lighting of a section of Whitehall, which is at present inadequate. The specification was for providing, lighting, and maintaining fifteen 20-feet columns and lamps of 700-candle power; and the tender of the Scott-Snell Self-Intensifying Gas-Lamp Company, at an initial cost of £23 per lamp and an annual charge of £17 each, was accepted.

Ilkeston Gas Supply.—The accounts of the Ilkeston Corporation gas undertaking show that there was an increase of about 11 million cubic feet in the quantity of gas made during the twelve months ending March 31. The receipts amounted to £15,872, of which £11,840 was for gas, £3747 for residuals, and £285 for sundries. This was an increase of £2103. Deducting the expenditure on manufacture and distribution, a sum of £5648 remained available for interest, repayment of loans, and other standing charges, amounting in all to about £4500. As the new contracts for the purchase of coal and the sale of residuals appear to be favourable, the Gas Committee confidently hope that, after the end of the financial half year, they may be able to consider some further concession to the consumers.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Monazite.

SIR,—We have read with much interest your account of the steps taken by Sir George Livesey and Mr. Tysoe in this matter; and they merit much praise for all they have done. It appears that we were both unconsciously working on the same lines; both actuated by the same spirit—the public benefit; and almost, if not quite, simultaneously. Our first letter to the Board of Trade on this particular subject was dated Feb. 18 last.

We, however, as the facts developed themselves, were dissatisfied with the probabilities of a successful issue to the Brazilian negotiations, and for these reasons: 1. The Brazilian Government wished to sell a concession, and that, too, at what we thought an exorbitant figure—£5000. 2. They wished to levy a duty on the exported monazite, equally extravagant—40 per cent. *ad valorem*. We do not glean that either of these conditions has been withdrawn.

These disadvantages, with other difficulties which were well known to us as well as to others (but which it is needless to repeat here), induced us to turn to other sources—aided as we were very largely by the energetic assistance of the Commercial Intelligence Department of the Board of Trade.

It is patent that if monazite can be obtained in quantity within ten days of these shores, and if no concession has to be bought, and no duty paid, then the owners of such a source of the sand are in a better position to deal with the demand than concessionaires whose seat of operations is so far distant as Bahia, and who have to pay a premium for the right to either extract or export a dutiable article. We are now speaking of the terms of the contract which has been disclosed, and of which we hold a copy.

We, therefore, turned our attention to other sources of supply—Canada, South Africa, New Zealand, the Placer Gold Mines of Australia—not excluding the United States of America. In this latter country, we were successful. We have particulars of an estate, some 12 square miles in extent, situated in North Carolina, within reasonable distance of transport to a shipping port by rail, and hitherto unexploited. The reports from this estate, issued by the Resident Manager, show that there is abundance of monazite mica (of which we have samples) and its associated minerals, not even excluding gold, to be found on it. There is plenty of water power for working; freights are low; there are no restrictions on mining; and there are no royalties and no duties on export.

The representative of the freeholders (of whom he is one), who are of British nationality, will leave to-day to arrange for the exploiting the sand, and for the export of the mineral here. We anticipate that the first hundredweight of the sand will be in our hands for the purpose of analysis and testing in the course of a mail or so. For this, we already have offers from makers of thorium in Germany, who will buy to any extent; but it is proposed, in the first instance, to endeavour to found a refinery in Great Britain, unless indeed, with the materials to be obtained on the spot, the monazite can be more profitably worked *in situ*. The thorium could, of course, be extracted as oxide and exported to Europe in that form.

So much for our latest intelligence, which (in accordance with our promise) we beg, through the medium of the "JOURNAL," to make public property. We will introduce anyone interested in the matter, and who has proper credentials, to the solicitors for the freeholders, who are an English Company. We are working in the public interest rather than for private advantage; our object being the same as that of Sir G. Livesey, as we understand it—viz., to smash a corner prejudicial to the gas and mantle industries, and which, with all due deference to him, we think can be better accomplished in North Carolina than in a far-away corner of the foreshore of Brazil.

THE NEW EXPORT COMPANY.
(L. S. LIEBERMANN, Manager.)

Mansell Street, E.C., July 29, 1903.

Gas Explosion in an Electric Lamp.—The Maidstone Gas Company have for some time past been unsuccessfully endeavouring to find a leak in one of their mains. The escape has therefore continued; and on the electric light authorities opening the roadway to connect a new lamp, the gas percolated through the soil which was thus disturbed. The result was that the gas accumulated in the globe of the lamp; and when the current was turned on, there was an explosion which wrecked it.

Effect of Heavy Rainfall upon Deep Wells.—Mr. H. G. Fordham, writing to the "Cambridge Chronicle," furnishes particulars in regard to the effect of the heavy June rains upon a well adjoining his house at Adsey, as ascertained by a float and scale fixed by him to show the daily movement in the surface of the water. He says: "Prior to the torrential rain of the third week in June, the water-level had been for some time rising at the rate of about ½ inch a day. The rainfall recorded on the seven days from the 13th to the 19th of June was 5·2 inches. This rainfall immediately affected the level of water in the well. From the 17th to the 18th, the rise was 2½ inches; from the 18th to the 19th, 3½ inches; from the 19th to the 20th, 4½ inches; from the 20th to the 21st, 3½ inches; and from the 21st to the 22nd, 6 inches. From the last date to the 2nd of July, the rise per day was regularly from 6 to 7 inches, reaching in one case as high as 8 inches in the 24 hours. Since the 2nd of July the daily rise has gradually diminished, and has now (July 20) come to an end. The result is a rise of exactly 10 feet in the period from June 19 to July 19." Mr. Fordham adds that the well is situated at 255·89 feet above Ordnance datum, and is sunk to a depth of 96 feet in the middle chalk. At the date of writing, the water-level stood at 76 feet from the surface; giving a depth of water of 20 feet, compared with only 1½ feet on the 1st of January.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Thursday, July 30.

BECKENHAM URBAN DISTRICT COUNCIL BILL.

On the motion for the third reading of this Bill,

Earl STANHOPE moved an amendment to omit clause 40, which he contended was both unusual and unnecessary.

The Earl of MORLEY said the clause afforded special protection to an individual Company against the dangers of electrolysis. The practice, however, had been to refuse requests for individual protection, on the ground that the Board of Trade regulations, if properly carried into effect, were sufficient, and that, if not, the proper course was to make them more stringent.

Lord KINNAIRD observed that, at all events, the clause would not do any harm. He pleaded for delay, so that more inquiry might be made before depriving the Crystal Palace District Gas Company of the protection contained in the Bill.

Lord WOLVERTON said there was no evidence that the Board of Trade regulations were not effective.

The clause was negatived, and the Bill read a third time and passed.

The following further progress has been made with Bills:—

Bills reported: Crystal Palace District Gas Bill, Ebbw Vale Improvement Bill, Sheffield Corporation Bill.

Bills read the third time and passed: Bath Corporation Water Bill, Ebbw Vale Improvement Bill.

HOUSE OF COMMONS.

Thursday, July 30.

Amendment of Standing Orders Relating to Private Business.

Mr. J. W. LOWTHER (Chairman of Ways and Means) said the period of the session had arrived when the House should consider the arrangements for private business, and make such alterations in them as might be necessary. He had placed on the paper a number of amendments to the Standing Orders, which, for the most part, carried out the recommendations of the Committee appointed to consider any alterations that were desirable in the interests of economy, efficiency, and general convenience. He moved to amend Standing Order 29 in order to provide that, in parishes which had no Parish Council, the promoters of any Bill affecting matters within the parish should deposit with the chairman of the parish meeting such plans as might be required by the Standing Orders.

The amendment was agreed to.

Mr. LOWTHER next moved to amend Standing Order 32 in order to substitute Dec. 17 for Dec. 21, as the date for depositing petitions for Private Bills in the House. He mentioned that the 17th of December was the date in the House of Lords.

After some discussion, the amendment was agreed to.

Mr. LOWTHER moved to amend Standing Order 62, in order to provide that, within five weeks after the petition had been endorsed by the Examiners, the Wharncliffe meeting must be held. He said the object of this amendment was to compel promoters of Bills to hold the Wharncliffe meeting within a reasonable period after the first reading of the Bill. He hoped the result would be that the Committees would be able to commence work at an earlier period of the session than had hitherto been the case.

The amendment was agreed to.

Mr. LOWTHER next proposed to amend Standing Order 79, so as to allow the Lord Chairman, with the assistance of his Counsel and the Speaker's Counsel, to decide, on or before the 28th of January, in which House each Bill shall originate. He explained that hitherto the division of Bills had taken place on the first day of the session.

The amendment was agreed to.

The present Standing Order 87 was repealed, and the following substituted:—

The Chairman of Ways and Means, or the Deputy-Chairman, with not less than seven other persons, who shall be members of this House, and shall be appointed by Mr. Speaker for such periods as he shall think fit, shall be Referees of the House on Private Bills, and shall have the assistance of the Counsel to Mr. Speaker; such Referees to form one or more Courts, three at least to be required to constitute each Court.

In Standing Order 98, the members of the Committee of Selection were increased from seven to ten.

Standing Order 109 was amended so as to constitute the Committee on Unopposed Bills of five members—viz., the Chairman of Ways and Means, the Deputy-Chairman, two members from time to time selected from a panel to be appointed by the Committee of Selection, and the Speaker's Counsel.

Standing Order 110, dealing with a form of Bill now obsolete, was repealed.

Standing Order 129 was amended so as to provide that—except in the case of (*a*) any Bill brought from the House of Lords, (*b*) any Bill as to which compliance with the Standing Order as to the time for depositing it has been dispensed with, and (*c*) any Bill promoted by the London County Council introduced under Standing Order 194—all petitions shall be deposited on or before the 12th of February. In the case of the three excepted classes of Bills, a petition against the Bill may be deposited at any time not later than ten clear days after the first reading. It was also provided that all Private Bills should be taken "as read." The Bill would be deposited on the previous day in the Private Bill Office, and laid on the table of the House; and this would *ipso facto* constitute first reading. The effect of the amendment

will be to save a little time and a good deal of unnecessary routine work gone through in the House at the beginning of each session.

Standing Order 133A was amended so as to allow Chambers of Commerce to be heard in relation to rates and fares.

An important amendment was made in Standing Order 134B, under which the Referees have the power to admit a County Council as petitioners against a Bill by which they may be injuriously affected. As altered, the privilege is extended to "a Joint Committee or Board of Councils of Administrative Counties or County Boroughs."

Standing Order 137, dealing with the Committee on Unopposed Bills, was omitted; another Committee having been constituted.

The following new Standing Order (157A) was agreed to:—

In the case of any Bill relating to the generation of electricity for supply to persons or bodies other than the promoters, the Bill shall not be reported by the Committee until a report from the Board of Trade on the powers sought has been laid before the Committee; and the Committee shall report specially to the House in what manner the recommendations or observations in the report of the Board of Trade, and also in what manner the clauses of the Bill relating to the powers sought, have been dealt with by the Committee.

An amendment was made in Standing Order 193, so as to provide that no Bill shall be brought into the House except upon a petition first presented, which is to be deposited in the Private Bill Office, with a printed copy of the proposed Bill annexed. The effect of this amendment will be that it will not be necessary for a petition to go twice before the Examiners.

Standing Order 193A was amended so as to fix Whitsuntide as the latest date for the first reading of a Provisional Order Bill, instead of the 1st of June, as at present.

The following new Standing Orders were substituted for those now in the book:—

195.—All Private Bills shall, on the day previous to the day fixed for their being laid upon the table of the House, be deposited in the Private Bill Office, and shall be laid by one of the Clerks of that office on the table of the House, together with a list of such Bills.

196.—Where the Examiner has endorsed the petition for a Private Bill "Standing Orders complied with," the Bill shall be presented by being laid upon the table of the House not later than one clear day after such endorsement; or if, when it is endorsed, the House is not sitting, then not later than one clear day after the first sitting thereof subsequent to such endorsement; and if the House is not sitting on the latest day on which the Bill ought to be laid upon the table of the House, then the Bill shall be so laid on the first day on which the House again sits. Where the Examiner has reported with respect to any Private Bill that the Standing Orders have not been complied with, and the report has been referred to the Select Committee on Standing Orders, and the Select Committee on Standing Orders shall have reported that the Standing Orders ought to be dispensed with, the Bill shall be presented by being laid upon the table of the House not later than one clear day after the House has given leave to the parties to proceed with the Bill.

197.—A Private Bill shall, when laid on the table of the House, be deemed to have been read a first time and ordered to be read a second time, or referred to the Examiners, as the case may be, on the day on which it is so laid, and shall be recorded in the votes as having been so read.

The last of the group of amendments was made to Standing Order 208A, the effect being to enable a Committee to which a Provisional Order Bill has been referred to separate the opposed Orders from those unopposed, to deal with the latter first, and send them down to the House before they consider the others. It often happens that in a large group of Provisional Orders contained in one Bill, some only are contentious and all the rest unopposed, and it will now be possible to allow the latter to go forward.

There were a number of consequential amendments to the Orders, but no new proposals.

The following further progress has been made with Bills:—

Lords Bill read a second time: Irvine and District Water Board Confirmation Bill.

Lords Bills reported: Bradford Corporation Bill, Bury and District Joint Water Board Bill, Gas and Water Orders Confirmation Bill, North-Western Electricity and Power Gas Bill.

Lords Bills read the third time and passed: Chard Corporation Gas and Electricity Bill, Irvine and District Water Board Confirmation Bill.

HOUSE OF COMMONS COMMITTEE.

Tuesday, July 28.

(*Before Sir* A. F. GODSON, *Chairman, Mr.* W. JONES, *Mr.* NICHOLSON, *and Mr.* SKEWES COX.)

NORTH-WESTERN ELECTRICITY AND POWER GAS BILL.

This Bill, the preamble of which was passed on the 23rd ult., came before the Committee for the adjustment of clauses.

Mr. HONORATUS LLOYD, on behalf of the Stockport Corporation, brought forward clauses to give the Corporation further protection for their water-mains situated in Derbyshire than was already given by the Bill. The pipes in question were to be constructed in the Derbyshire parishes of Hayfield and New Mills. He said that what the Corporation were asking for was this: First of all, that the Company should not raise, sink, or otherwise interfere with their 27-inch mains to be laid for the purposes of this supply without the consent of the Corporation; and that the Company should not, except for the purpose of crossing the main that the Corporation would have to lay there, lay their main within 3 feet of that of the Corporation. The importance of this was that any interference with the 27-inch main would lead to the general disturbance of the water supply of Stockport. What the Corporation were most anxious to do was to be able to secure the main from interference; and that was why they were seeking to provide that the Company should not interfere with it without the consent of the Corporation. They asked that the Company should not come within 3 feet because, if they began excavating a trench for the purpose of laying their large power-gas mains, there was nothing in the world to prevent one of their men's picks going through the 27-inch main. The Bill was of a novel character, inasmuch as it dealt not only with electrical power, but also gas power; and the promoters sought to make applicable to gas-mains, which might be 3 feet, or 3 ft. 6 in. in diameter, provisions which, by the Electrical Clauses Act, were intended to deal with electric wires. The promoters also sought to give the Corporation protection when they were opening for the first time, and to give them no protection when they were opening for renewals and repairs. The Corporation asked that any additional expense incurred by reason of the construction of the Company's mains should be borne by the Company.

Mr. BALFOUR BROWNE said that the Corporation were sufficiently protected by the clauses in the Bill. This was not the only place in England where there was a main of 3 feet to 3 ft. 6 in. diameter, for there were far larger mains going to Manchester and in Wales. In the Lancashire Power Bill, there was no clause such as that sought by Stockport. There they were content with the general law; and he thought that Stockport also ought to be. With regard to electric wires and conduits, everybody was protected by the general Act of 1899. The promoters gave them exactly the same protection for the gas-mains as they had for the electric wires. There were penalty clauses; and the protection was very ample indeed. The Corporation asked that they should not come within 3 feet of their water-main. Was that a reasonable provision? He was told that instead of 3 feet—where it was fought out in an arbitration—3 inches was considered sufficient between an electric and a water main.

Mr. LLOYD: There was no gas there.

Mr. BALFOUR BROWNE said that would make no difference. Precisely the same thing was fought in the Bristol Bill; and the Committee decided that the general law was sufficient in that case.

Mr. LLOYD: Our desire is that our water supply to start with should not be stopped, and we only have the remedy of a penalty of £5.

Mr. BALFOUR BROWNE: And compensation besides.

Mr. LLOYD said that in such a case compensation would not suffice.

The CHAIRMAN: Compensation in such a case would mean pretty near ruin to the Company.

Mr. LLOYD said that compensation would be all very well in the case of a water company, but to a corporation it would be no good. There was this difference between a corporation and a company—that whereas a water company carried on their undertaking (he would not say for profit, but having profit in the background) his Corporation were prohibited making any profit. Their only power was to supply water; and he was there simply to seek protection for the water. A penalty of £5 or £10 or compensation would be no use to him.

The Committee were of opinion that the Stockport Corporation were sufficiently protected by the Bill as it stood.

Some question was raised as to the provision in the Bill—that if the Company did not supply energy in any area within ten years, their powers in respect of that area should lapse.

Mr. BALFOUR BROWNE said that the gas companies were satisfied; but if the Committee wished, it could be altered to 7½ or 7 years.

The CHAIRMAN: Then we will give you seven years.

The Committee were also anxious to know what were the intentions of the promoters as to capital now that the area had been lessened.

Mr. BALFOUR BROWNE said that they thought the Committee took the view that, having regard to the great size of the area they were proposing to annex, they had not got sufficient capital for the mains that would be necessary to supply the whole area, and that, consequently, the Committee cut out Cheshire. Under these circumstances, they wanted to adhere to the whole capital in order to carry out the idea of the Committee.

The CHAIRMAN: You say that the whole matter has been considered?

Mr. BALFOUR BROWNE replied that it had been carefully considered. As the Bill was originally framed, they would very likely have had to come for additional capital; and now they thought it better to keep the capital as it stood for the mains that might be necessary.

The CHAIRMAN: The Committee are quite content.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, July 27.

(*Before Mr. Justice* LAWRANCE *and a Special Jury.*)

Ilford Urban District Council v. Jackson.

This was an action in regard to a matter which came before his Lordship and a Special Jury about this time last year. In the first instance, it was a claim by the Ilford Gas Company against the Urban District Council for damage done to their main by the carrying out of sewerage works. The Council brought in the present defendant (the Contractor) as a third party; and, in the result, he was adjudged liable, quite apart from the question of negligence, of which the Jury found he had not been guilty. Mr. Jackson appealed, and the case was heard early last month (*ante*, p. 118). It was submitted, on behalf of the Council, that the finding of the Jury was not binding upon them; and it was arranged that there should be a new trial on the issue formulated. This took place to-day.

Mr. C. A. RUSSELL, K.C., and Mr. WHATELEY appeared for the plaintiffs; and Mr. H. E. DUKE, K.C., and Mr. MACKENZIE represented the defendant.

Mr. RUSSELL said in this case the Jury had to try an issue which had been directed by the Court of Appeal between the plaintiff Council and Mr. Jackson, a contractor, who, in 1901, was employed by the Council,

under a contract dated February, 1901, to construct and lay certain sewers in Green Lanes, Ilford. In the course of laying these sewers, they had in several places to be carried underneath gas-mains, which were the property of the Ilford Gas Company. Injury had been done to the mains; and the question which the Jury had now to try was whether the injury was due to the nature of the works which Jackson, as Contractor, was bound or directed to execute, or whether the injury was due to the mode in which the work was executed. A 12-inch sewer had to be laid in Green Lanes at a considerable depth. The work was commenced in April; and at two points, opposite Ash Grove and Camden Terrace, it was found that the straight line of the sewer would have to cross the gas-mains, which were laid somewhat irregularly at these places. While the sewer was being laid, the usual method of supporting the gas-mains by brick piers was adopted. The work having been done in July, 1901, the Gas Company gave notice that a leak had been discovered opposite Nos. 35 and 36, Camden Terrace; and, on examination, it turned out that the gas-main there was fractured. Later on, at the end of October, the Company again gave notice that another leak had been discovered; and it was found that the gas-main opposite 26-28, Camden Terrace, was fractured. The fracture in each case was at a point between two of the brick piers supporting the main. The Gas Company brought an action against the Council to obtain compensation for the damage done. The Contractor suggested that there was something wrong either about the design of this method of support—this system of putting in brick piers—or that the directions which were contained in the contract as to the filling in and ramming of the trench were not, in the circumstances, proper directions, and that the damage to the main was due to one of these causes. On the other hand, the District Council said that the fractures could not have taken place if the filling in of the earth in the trench had been properly done—that this system of supporting a gas or water main which was crossed by a trench, was not something invented for this particular case. The Jury would hear from gentlemen of great experience in this kind of work that this was a regular and approved method of support in such circumstances, the soundness of which had been tested and proved by its successful adoption in many cases. They would also hear that the soil of the road was of an excellent character for the purpose of filling in; that if it was properly done, nothing was wanted except to follow the directions of the contract with regard to filling in; and that what must have been the cause of the damage here was that the work of filling in was not done with equal thoroughness at Camden Terrace as it was at Ash Grove. The gas-main at Ash Grove had stood to this day; and therefore, as the same system of work was adopted at each place, it must have been a difference in the mode of filling in at Camden Terrace which had caused the damage. During the progress of work, the Contractor never made any suggestions either as to the method of supporting the gas-main by brick piers or as to the character of the material used for filling in; and therefore the inference was irresistible that it was his mode of work which brought about the damage.

Mr. *Godfrey M. Taylor*, a Civil Engineer employed by the District Council, gave evidence in support of their case. He said the soil consisted of clay and sand, and was good material for ramming. The subsidences which caused the leakages in the main, in his opinion, indicated improper ramming of the trench at the places in question. There was no other way of explaining the matter. He had no reason to complain of the Contractor's work in any other respect, as it was all good. The system of supporting gas-mains by brick piers was one which was usually adopted in such cases.

The examination and cross-examination of witness occupied a long time, but the whole substance of it is contained in this summary.

Mr. *Hetherington*, the Resident Engineer, gave similar evidence. He considered the damage was due to insufficient ramming. The method of support by brick piers was usual and proper.

In cross-examination, witness said he considered the work was well done during its construction, and that the Contractor had carried out his orders.

Sir *Alexander Binnie* gave evidence to the same effect. Experience had shown that the method described in the specification—which he had seen and approved—was perfectly effectual. He had examined the soil in the trial holes, and considered it very favourable for such work; it lent itself very well to consolidation by ramming. His rule with regard to 3-inch gas pipes which required support was to put a brick pier under the joints if the length unsupported exceeded 6 feet. He had never known of a continuous bed of concrete being laid under a gas-main.

Mr. *James Bond*, the Clerk of the Works, was next called. He said the work was done properly so far as he saw; but he could not, of course, inspect every yard.

Tuesday, July 28.

Mr. *Whiteley*, the District Surveyor of the Essex County Council, in whose jurisdiction Green Lanes is included, deposed to sending letters to Mr. Jackson in July, 1901, complaining of the state of the road; the trench in which the sewer had been laid not having been rammed, so that he was afraid to send the steam-roller over it. There was a considerable subsidence in one place. In August there was further cause for complaint.

In cross-examination, witness said a trench would always settle, and required further metal to be added on top from time to time. In his opinion, the trench ought to have been filled in and rammed in 6-inch layers, not 9-inch as provided in the specification in question; and hard core also should have been specified for filling in. Layers of 4 inches and 6 inches were often specified; but he had never known of 9-inch layers before.

Mr. *J. H. Brown*, of Nottingham, formerly Engineer to the Ilford Gas Company (called on subpœna), said he remembered the injuries which were occasioned to the gas-main. The filling in below the pipe had settled very considerably. The main was supported on brick pillars, and in places by wooden struts, which had pushed it out of line—it was like a switchback. In some places, there were cavities of 2 or 3 inches under the main; and the pipe in breaking had opened ¾ inch. He superintended the laying of some fifty miles of mains for the Ilford Gas Company. He attributed the fractures to the faulty filling in of the sewer trench. He was of opinion at the time that there had been great carelessness in the filling in and ramming.

In cross-examination, witness said the material used for filling in was very unsuitable for the purpose; it was a kind of loam. The trench ought to have been filled in with hard core. Where the sewer crossed the line of the gas-main, the material used was improper, and it had not been properly filled in. It would have been better if the brick piers had been omitted altogether, or there should have been double the number.

Mr. *G. R. Strachan* said he had read the specification in question, which he quite approved, after examining the character of the soil. The 9-inch layer was merely nominal; in practice, the material was rammed continuously as it was filled in. He constantly drew up similar specifications himself. He proceeded to give an elaborate theoretical explanation of the forces operating on a pipe lying in the ground, and the effects which would ensue under varying conditions. He did not think it was right to put hard core to support a gas-main.

This concluded the case for the plaintiffs.

Mr. MACKENZIE, in opening for the defendant, drew attention to letters written before the accidents, in which the plaintiffs' Surveyor spoke of the work having been well done, and submitted that, even on the evidence of plaintiffs' own witnesses, the design of the works was the cause of the damage, not the mode in which it was carried out.

Mr. *John Jackson*, the defendant, was then called. He said that the work had been carried out exactly according to the specification, and to the satisfaction of the Engineer, as shown by his certificates.

In cross-examination, witness said he had other contracts in hand at the same time. There ought to have been more brick piers, or, what would have been better, the pipe should have been moved. He had seen hundreds of trenches opened, where gas-mains had been crossed, and always found the earth had sunk from under them, and the pipe was acting as a girder. The filling in was practically no support to the pipe where there were girders at intervals.

Mr. *Henry Jackson*, son of the defendant, said he was on the work in question almost daily. When they came across the gas-pipes, he got instructions from the Resident Engineer how to deal with them. The Clerk of the Works pointed out where the brick piers should be placed. No complaint was made during the progress of the work.

Abraham Newman, foreman to defendant, said the directions of the Resident Engineer and Clerk of the Works were properly carried out. He told the latter there ought to be more piers.

Mr. *E. Smith*, at present in charge of all the main roads of Hertfordshire, said it was impossible to so ram a trench as to prevent any subsidence. A 3-inch gas-pipe, supported only at the two ends, was not strong enough to carry the weight of traffic passing over it.

At this point, the Jury intimating that they had made up their minds,

Mr. MACKENZIE said he had other evidence; but in face of this intimation, he would leave the case there.

His LORDSHIP then read the issue to the Jury, who said they quite understood it. They were of opinion that the defendant Mr. Jackson had carried out the work quite satisfactorily.

Mr. MACKENZIE asked for the costs of the trial; but his Lordship, referring to the Order of the Court of Appeal, said all costs were reserved—to be dealt with by that Court.

THAMES POLICE COURT.—Tuesday, July 28.

(*Before* Mr. MEAD.)

Crow v. East London Water-Works Company—Cutting off a Supply.

To-day the East London Water-Works Company were summoned by Mr. Arthur Crow, Surveyor, of Great Prescott Street, Whitechapel, for cutting off his supply of water for domestic purposes.

Mr. MACMORRAN. K.C., appeared for the complainant; Mr. D. C. BARTLEY represented the Company.

Mr. MACMORRAN, in opening the case, said the summons was taken out under the Water-Works Clauses Act, 1847, which provided that if a Company refused to furnish a supply of water to any owner or occupier entitled to receive it, they were liable to a penalty not exceeding £10. The facts were very peculiar. Mr. Crow was the occupier of No. 18, Great Prescott Street, and had been supplied by the Company for a number of years. On Saturday, the 11th of July, the Company's foreman waited on Mr. Crow and informed him that there was a leakage in the communication pipe between the main and his premises. Mr. Crow went out and saw there was a leakage. Not being able to find his own plumber, he engaged a man, recommended by the Company's foreman, to repair the defect. This was done by midday, when the foreman demanded 11s. 7d. as the cost of opening the road. Mr. Crow had not the money about him, but he said he would remit it, at the same time intimating that he should like to be furnished with particulars respecting the charges. He was told that if the amount claimed was not paid the supply would be cut off, and this was done. The Company had power to cut off the supply for the purpose of preventing waste; but in the present case it was not cut off until after the leakage had been stopped. The Company were written to, and they replied that the supply could not be reconnected until the "re-lay" charges, amounting to £1 3s. 2d., had been paid. He (Counsel) submitted that this was a perfectly unjustifiable act. Mr. Crow, in order to bring himself within the provisions of section 43 of the Act, went to the Company's office and paid the water-rate up to Christmas. His object in taking these proceedings was not to recover a penalty, but to get a ruling that he was entitled to a supply of water, of which he had been deprived for 17 days.

Evidence in support of the opening statement having been given,

Mr. BARTLEY, on behalf of the Company, called the foreman who repaired the leak. The sum of 11s. 7d. which was demanded was, he said, for the re-making of the road and the men's pay.

In answer to a question by Mr. Macmorran, Mr. BARTLEY said the £1 3s. 2d. was on account of all the charges; but the full amount had not been put down. Mr. Bartley submitted that the Company were right in what they had done, and, in support of his contention, quoted the case of the *Sheffield Water-Works Company v. Wilkinson*. In that case, it was held that the Company were not bound to supply until communication with the premises had been restored.

Mr. MEAD said he considered the Company had committed a breach of the Act in cutting off the water. He was bound to say they had acted in a high-handed manner; but as they had promised to reconnect the water at once, there would only be a penalty of 1s. and £10 10s. costs.

Nuisance at the Holyhead Gas-Works.

Some three months ago, his Honour Sir Horatio Lloyd, sitting at the Menai Bridge County Court, reserved judgment in a case in which Mr. E. T. Edwards sought to recover £50 damages against the Holyhead Gas Company for an alleged nuisance caused by the manufacture of gas. He also asked for an injunction to restrain the Company from continuing the nuisance. It was alleged on behalf of the plaintiff that, owing to the bad condition of the gas, the Company erected new purifiers at the back of his house, which was near the works. This caused an intolerable nuisance, which made the house practically uninhabitable. Previously, the "noxious matters" were distributed evenly; but since the new purifiers were installed they had been concentrated close upon the plaintiff's house. Plaintiff's wife and daughter were taken ill, in consequence of the smell of sulphuretted hydrogen. Mrs. Edwards said that since the new purifiers had been put up, the walls inside the house had been discoloured; and the smell some days was unbearable, especially in winter. Her head, eyes, chest, and throat were affected; and she had to consult a doctor. Her daughter had been affected much in the same way. Corroborative evidence was given by Miss Edwards. Dr. Clay said he had lately been attending the witnesses, and found them suffering from the effects of the sulphurous smell which came from the purifiers. Other evidence was given showing that the value of the house had been depreciated by the smell; and the Manager of the Bangor Gas-Works said the smell could be stopped at the expense of a few hundred pounds, by the erection of another purifier. For the defence, Mr. Smith held that no injunction should be granted in cases where great interests of public utility were concerned. There would, of course, be noxious smells from time to time; but every slight annoyance was not to be magnified into a cause for action which would support an injunction. The case had been greatly exaggerated. The plaintiff's wife did not get ill until January, just after a flood in the house; and he held that the discoloration of the walls was due to gases from the drains, and to the general dampness caused by floods. There was stagnant water at the rear of the house, which would account for the ill-health of the occupiers; and the drainage was bad. Should an injunction be granted, it would inflict a great hardship upon the public of Holyhead; for it would stop the lighting of the town. Mr. G. E. Saville, the Manager of the Company, said that the new purifiers were quite up to date, and would not emit much smell when they were opened. The Company, in order to avoid any smell at all, intended to build walls around the purifiers. No one save the plaintiff had complained; and if the Company were prevented from using the purifiers, they would have to stop making gas, and Holyhead would be in darkness. At the Carnarvon County Court last Wednesday, his Honour mentioned the case. He said the plaintiff was undoubtedly entitled to judgment for certain damages in consequence of the nuisance. The amount, however, had not yet been determined. He had visited the place; and if the matter were allowed to stand over till September, without declaring formal judgment, it might prove more effective. The case was therefore allowed to stand over by consent.

The Assessment for Water-Rate of Tenement Houses.

At the Brentford County Court, on the 17th ult., the Grand Junction Water Company sued a Mr. Shields for £32 10s., the water-rates on the houses in Shirley Gardens, Hanwell. The Company further asked for a declaration that this amount was to be a first charge on the houses, and for a receiver of the rents. It was stated that Shirley Gardens was a building estate; and as each house was built, the water was connected at the request of a Mr. Smith. After this, no rates were paid; Mr. Smith could not be found, and defendant was returned as the agent. The defendant would not disclose the name of the owner; and therefore he was sued as the person liable under the statute. Mr. A. H. Ince, collector to the Company, stated that the claim was quite correct. He had seen the defendant several times with regard to the rates; but he had declined to pay, and refused to give the names of the owners. The tenants had been served with notices, but without avail. The first rate was paid by a man named Smith, who was the person who applied for the water to be connected. Mr. Jesse Drinkwater, in the employ of the Company, said he assessed the defendant's houses. All but three were assessed under £20, and three at £20. He arrived at his figures first by taking the rent, then deducting a fifth for repairs, and then the rates and taxes. The rateable value on the rate-books was £20. He did not allow for empties. Mr. Proctor (for the defendant): Then for these three it is £21. His Honour Judge Shortt, K.C.: What is the point about £20? Mr. Bartley (for the plaintiffs): Where it is over £20, we are bound to go against the tenant. Witness said he could not fix any percentage of empties. Mr. Proctor contended that all the houses but three were let in flats, and the plaintiffs had assessed each flat separately. There was no separate front door to each; and there was a decision of the House of Lords that under such circumstances they must be counted as one house. Being one house, the gross assessment would be over £20; and the plaintiffs would therefore have to go against the occupier. Mr. Bartley contended that, under their Act, the Company could assess each tenement. His Honour, having perused the Act, found for the Company, less three houses, and granted the application for a receiver.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

Half-Yearly Report and Accounts.

The following is the report on the working of the Company in the six months ended June 30, which, with the accounts for this period, will be submitted to the proprietors on Friday:—

The accounts for the past half year show that, after providing for the fixed charges, there remains a balance, including the amount brought forward, available for distribution of £451,880 11s. 6d., out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 8s. per cent. per annum, carrying forward the sum of £116,530 3s. 6d. to the credit of the current half year. The rate of dividend paid for the corresponding half year of 1902 was £4 per cent. per annum, and the amount then carried forward was £68,165 8s. 1d.

The quantity of gas sold during the half year was 10,286,208,000 cubic feet, which is less by 4 per cent. than the quantity sold during the corresponding period of 1902. In the month of February alone, owing to the prevalence of abnormally mild and light weather, there was a reduction in the output of gas equal to 80 per cent. of the whole of the half-year's loss of sales. It must also be borne in mind that the extension of the incandescent system, both for public and private lighting, profitable as it is to the consumer, tends to check temporarily the consumption of gas.

The improved financial result of the half-year's working has been obtained by a reduction in the cost of coal, savings in the item of wages brought about by the extended use of machinery, and by the increased values of coke and other residual products,

It is satisfactory to be able to report that contracts for the supply of coal for the current twelve months have been secured at prices slightly below those of last year.

The Directors are pleased to report that the Royal Assent was given to the Company's Bill in Parliament on the 30th of June. By this Act, the Company obtain power to create and issue debenture stock not exceeding the nominal amount of £750,000. This is coupled with provisions for a new standard price of 3s. 4d. per 1000 cubic feet of gas, and for a revised sliding-scale of dividend. There is a further provision for the redemption, out of profits available for dividend, of obsolete capital by the purchase and extinction of ordinary stock of the Company to the nominal amount of £1,000,000. The effect of these provisions will be that, after Jan. 1, 1904, with the price of gas at 3s. per 1000 cubic feet (the price now charged), the proprietors will be entitled to a dividend not exceeding the rate of £4 8s. per cent. per annum, the rate which it is now recommended should be paid for the past half year.* While the terms thus secured are less favourable to the Company thant hose which were submitted to the proprietors in February last, the Directors are satisfied that, in view of the course of recent gas legislation, the settlement is one which should be accepted alike by the consumers and the proprietors as a fair compromise on points which have been in dispute between them during the past few years.

An important step has recently been taken towards the settlement of another question which affects all the Metropolitan Gas Companies alike. For some time past there has been a growing dissatisfaction among these Companies with the gas-testing regulations prescribed by the Metropolitan Gas Referees; and it was with great satisfaction that the Directors received in April last an intimation from the Board of Trade that it was the intention of the Department to appoint a Committee to review the whole question. The Directors trust that the result of the inquiry will be the removal of the more onerous of the restrictions under which the Gas Companies in the Metropolis carry on their business, and which tend to unnecessarily enhance the cost of gas.

The Directors received with great regret in May last an application from Mr. J. W. Field to be allowed, on considerations of health, to resign his appointment of Secretary and General Manager to the Company, the resignation to take effect as from the 30th of September next. The Directors have already, by minute, recorded their high appreciation of the value of the services rendered by Mr. Field to this and to the late Imperial Company during a period of 47 years, and of his great devotion to the interests of this Company through the recent trying and arduous period of its history; and they feel sure that the proprietors will fully share in their regret that Mr. Field should have found it necessary to relinquish his office.

The Court have decided to apportion the duties of the office about to be vacated between two officers; and they have accordingly appointed Mr. Henry Rayner, now the Assistant-Secretary, to the post of Secretary, and Mr. D. Milne Watson, now the Assistant General Manager, to the position of General Manager. It will be for the proprietors, in accordance with the provisions of the Companies' Clauses Consolidation Act, 1845, to determine the Secretary's remuneration.

The Court of Directors have been furnished by the several Engineers of the Manufacturing and Distribution Departments respectively with the usual certificates that all the Company's plant has been maintained in thorough efficiency.

The accounts accompanying the report consist of the usual statements, from which we extract the following particulars:—

The statement of capital (stock) sets forth that the total paid up is £9,466,500; added on conversion, £12,176,565—total amount authorized, £21,643,065. The statement of loan capital stands thus: Total paid up, £2,844,000; added on conversion, £1,479,975—total amount authorized, £4,323,975.

The capital account shows receipts (with premiums, £1,586,807) to

* To enable the proprietors to apprehend exactly the effect of these new provisions, a tabulated statement accompanied the report, showing the net rate of dividend payable and the amount to be devoted to the redemption of obsolete capital within a given range of prices for gas.

the amount of £27,553,847 11s. 9d. The expenditure is shown in the following items :—

Expenditure to Dec. 31, 1902			£13,012,054 11 8
Expenditure during the half year to June 30, 1903—viz.,			
Buildings and machinery in extension of works.	£5,421 7 3		
New and additional mains and service-pipes	19,178 3 8		
Do. do. meters	17,830 8 0		
Do. do. stoves	15,080 8 7		
	£57,510 7 6		
Sale of surplus land	£1,205 7 0		
Depreciation of plant	15,972 2 0		
	17,177 9 0		
		40,332 18 6	
Total expenditure			£13,052,387 10 2
Nominal amount added on conversion			13,656,540 0 0
Balance of capital account			844,920 1 7
			£27,553,847 11 9

The following is the revenue account :—

Expenditure.

June Half Year, 1902.		£ s. d.	£ s. d.
	Manufacture—		
£744,069	Coals, including oil, dues, carriage, unloading, and trimming	671,029 12 7	
15,057	Salaries of engineers and other officers at works	16,060 4 4	
139,625	Wages, gas making £123,925 7s. 3d.	140,775 6 11	
17,363	,, sundries £16,849 19s. 8d.		
52,529	Purification, including £17,744 15s. 0d. for labour	47,562 18 5	
179,924	Repair and maintenance of works and plant, materials and labour, less received for old materials, £3898 12s. 5d	168,248 2 6	
			1,043,676 4 9
	Distribution—		
34,251	Salaries and wages of officers (including Rental Clerks)	35,619 1 3	
35,698	Repair and maintenance of mains and service-pipes	40,948 6 5	
33,545	Repair and renewals of meters	29,158 19 7	
28,792	Stove fixing, repairs, and renewals	27,893 1 9	
17,648	Gas-fittings (automatic meter supplies)	..	
			133,619 9 0
16,902	Public lamps—Lighting and repairing	..	17,004 1 11
	Rents, rates, and taxes—		
6,227	Rents payable	5,967 2 0	
140,787	Rates and taxes	138,928 15 1	
			144,895 17 1
	Management—		
2,750	Directors' allowance	2,750 0 0	
223	Company's Auditors and Assistant	216 16 0	
11,477	Salaries of Secretary, Accountant, and Clerks	11,899 11 1	
22,063	Collectors' commission	20,499 13 3	
7,306	Stationery and printing	6,554 9 6	
2,971	General charges	3,503 0 5	
			45,423 10 3
749	Parliamentary charges on account	..	2,400 0 0
1,238	Law charges	..	1,325 19 7
5,121	Bad debts	..	4,882 2 5
500	Depreciation fund for Works on Leasehold Lands	..	500 0 0
15,584	Annuities	..	15,595 15 1
1,126	Workmen's compensation account	..	665 2 6
..	Stamp duty on increase of nominal capital under the Company's Act, 1898, on account	..	5,000 0 0
	Public officers—		
1,258	Gas Referees and Official Auditor	1,258 19 4	
692	Public testing-stations	735 2 3	
			1,994 1 7
£1,536,475			1,416,982 4 2
504,923	Balance carried to net revenue account		580,494 2 9
£2,041,398			1,997,476 6 11

Receipts.

June Half Year, 1902.		£ s. d.	£ s. d.
	Sale of gas—		
£1,517,567	Common gas, per meter, at 3s. and 2s. 5d. per 1000 cubic feet	1,456,544 19 3	
	Public lighting and under contracts—		
76,020	Common gas	74,778 10 6	
			1,531,323 9 9
£1,593,587			
27,485	Rental of stoves	..	29,310 5 2
	Residual products—		
£263,715	Coke, less £36,423 14s. 3d. for labour, &c.	266,531 13 6	
12,826	Breeze, less £3126 0s. 6d. for ditto	13,697 18 3	
54,700	Tar and tar products	70,335 7 10	
84,094	Ammoniacal liquor and sulphate of ammonia	81,749 12 9	
			432,317 12 4
£415,335			
£4,704	Rents receivable		4,250 7 2
287	Transfer fees		274 12 6
£2,041,398			1,997,476 6 11

The balance available for division is £451,880 11s. 6d. ; and the statement showing how it is proposed to appropriate it is as follows :—

June, 1902.			
£64,834 ..	Net balance brought from last account		£65,146 19 4
308,195 ..	Net revenue for the half year		386,733 12 2
£373,029			£451,880 11 6
(£4 per cent.)	A dividend on the ordinary stock—		
£304,864 ..	£4 8s. per cent. per annum on £15,243,200		335,350 8 0
£68,165 ..	Balance carried to next account		£116,530 3 6

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on June 30 were as follows : Reserve fund, £56,464 ; insurance fund, £90,997 ; and depreciation fund, £53,733. The insurance fund had to bear in the past half year a sum of £48 16s. 7d., the value of plant destroyed by fires in the Company's district.

The net revenue account stands as follows :—

June Half Year, 1902.		£ s. d.	£ s. d.
£398,988	Balance from last account	400,497 7 4	
334,154	Less dividend on the ordinary stock for the half year to Dec. 31, 1902.	335,350 8 0	
£64,834			65,146 19 4
504,923	Revenue account	..	580,494 2 9
£569,757			£645,641 2 1

June Half Year, 1902.		£ s. d.	£ s. d.
£69,410	Interest on debenture stock and bonds, accrued to June 30, 1903	..	69,409 12 6
75,998	Dividend on the preference stocks	75,997 19 0	
45,500	Dividend on the 3½ per cent. maximum stock	45,500 0 0	
			121,497 19 0
5,820	Interest on temporary loans and sundry funds, less credits	..	2,852 19 1
373,029	Balance applicable to dividend on the ordinary stock	..	451,880 11 6
£569,757			£645,641 2 1

The following statements relate to the working :—

Statement of Coal Used, &c.

Description of Coal.	In Store Dec. 31, 1902.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1903.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	289,359	749,468	866,674	6,484	165,669
Cannel	17,217	2,710	*6,554	..	13,373
Total	306,576	752,178	873,228	6,484	179,042

* In addition to this quantity of cannel, 7,158,165 gallons of oil and spirit were used during the half year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1902.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1903.
Coke—tons	6,664	544,903	117,706	427,567	6,294
Breeze—tons	1,800	70,216	15,293	56,146	577
Tar—gallons	863,497	8,941,541	9,096,169	15,979	692,890
Ammoniacal liquor—butts	20,240	242,380	251,750	..	10,870

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts. (Estimated.)	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
* 11,042,504	488,805	9,797,403	10,434,181	48,696
† 11,539,950	505,062	10,209,008	10,878,563	49,263

* Including 2,183,432,000 cubic feet of "oil gas." † June half year, 1902.

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows : Coal, £128,009 ; oil and petroleum spirit, £30,941 ; coke, £3754 ; tar and ammoniacal liquor and products, £89,400 ; and sundries, £242,515. The figures this time last year were : Coal, £113,096 ; oil and petroleum spirit, £57,459 ; coke, £6700 ; tar and ammoniacal liquor and products, £76,779 ; and sundries, £235,634.

Unprofitable Water-Works at Wolverhampton.—The annual statement of accounts of the Wolverhampton Water-Works shows that there was a loss of £390 on the past year's working. The balance in the reserve fund at the beginning of the year, amounting to £2166, has been expended in extensions of mains ; and the revenue account has been debited with £3736, which represents the balance of the expenditure incurred on account of the Water Bill of 1902. The balance (£216) of the cost of the filtering plant installation at Cosford was also charged to revenue. It was originally proposed that the total expenditure under these heads should be defrayed out of the reserve. After making the extraordinary payments referred to, meeting the interest on the whole of the borrowed capital, and providing for the annual instalment to the sinking fund in respect to the portion of the water debt represented by the Wolverhampton Corporation 3½ per cent. stock, the loss on the year's account amounts, as already mentioned, to £390. The total sum expended up to date out of reserve and revenue, on account of the filtering plant installation at Cosford, has been £3822. The income for the past year was £32,922, and the expenditure £33,313. In the previous year, the profit was £2667 ; but during the past twelve months the expenditure has increased from £28,869 to £33,313, and the income from £31,528 to £32,922. In 1899, the profit amounted to £6632.

SOUTH METROPOLITAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the six months ended June 30 last.

Compared with the corresponding half year of 1902, there has been the small reduction of 4½d. per ton in the cost of coal, and some improvement in the receipts for coke, tar, and ammonia. On the other hand, the expenses of distribution have increased; with the net result that, after providing for all charges, there is a surplus on the half-year's working of £32,276 1s. 9d.

The Directors therefore recommend the payment of the full dividend to which the shareholders are entitled under the sliding-scale—viz., at the rate of £5 6s. 8d. per annum. In making this announcement, it is fair to state that, as the result of the issue of all new capital since 1876, under the auction clauses, the investor in the Company's stock only obtains the very moderate rate of 4¼ per cent. on his investment. The Directors make this statement to correct the very common and erroneous impression that gas shareholders are the recipients of very high dividends.

The amount brought forward was £11,177 19s. 1d., which, added to the half-year's surplus, gives a total of £43,454 0s. 10d. From this sum the Directors have taken £17,009 5s. 9d., or ½ per cent. on the paid-up capital, to add to the insurance fund "to meet any extraordinary claim, demand, or charge which may at any time arise against, or fall upon, the Company from accident, strikes, or other circumstances which, in the opinion of the Auditor, due care and management could not have prevented." The amount carried forward is £26,444 15s. 1d. The reserve fund now stands at £153,049 2s.; therefore, with the insurance fund of £90,213 0s. 2d., the total reserves now amount to £269,706 17s. 3d.

The reduction in the illuminating power of 2 candles, from 16 to 14, has not caused the consumers to burn any more gas. In fact, the lower quality suits them quite as well as the higher; their complaints are fewer, and they get the gas 2d. per 1000 feet cheaper, which saves them £96,000 a year. This fact is again stated because the London County Council strongly opposed the reduction, contending that the consumers would burn some 30 per cent. more gas, and be heavy losers thereby. The great *desideratum* for both shareholders and consumers, especially the latter, is cheap gas. The London County Council are not helping in that direction.

With the exception of the continued unfriendly action of the London County Council towards the Gas Companies—which is certainly not in the interest nor to the advantage of the gas consumers—the Directors have the pleasure to state that everything is working smoothly and satisfactorily. The officers and workmen are nearly all shareholders, with a stake of some £190,000, or an average of about £45 apiece, in the ordinary stock and on deposit at interest with the Company, and are, as a matter of course, rendering willing and cheerful service. The consumers also, the Directors are glad to acknowledge, are animated by a spirit of goodwill to the Company that is very gratifying. It is hoped that the time is not far distant when the price of gas will be again reduced.

The principal portions of the accounts are as follows:—

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £138,776 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,780,000. The third statement is the capital account. It stands as follows: Amount received, £4,872,096; nominal amount added by conversion (less premium), £3,057,904—total, £7,930,000. The items of expenditure are as follows:—

Capital account to Dec. 31, 1902			£4,426,468 0 8
Expenditure during half year to June 30, 1903, viz.—			
New buildings and machinery in extension of works	£18,121 5 3		
Purchase of new land and incidentals	11,576 12 0		
New and additional mains and services	14,082 10 11		
New and additional meters	13,254 0 2		
New and additional stoves	7,033 0 10		
		64,067 9 2	
Total expenditure			£4,490,535 9 10
Balance			381,560 10 2
			£4,872,096 0 0
Nominal amount added by conversion, less premium			3,057,904 0 0
Total			£7,930,000 0 0

The following is the revenue account:—

Receipts.

Sale of gas—			
Lady-Day at 2s. 3d. per 1000 feet	£372,093 14 4		
Midsummer at 2s. 3d. per 1000 feet	255,799 1 0		
	£627,892 15 4		
Public lighting, including labour, repairing, and materials	29,265 10 2		£657,158 5 6
Meters in use (257,054)—			
Company's meters at rent: Ordinary, 100,882; slot, 146,912	£26,032 17 1		
Company's stoves at rent: Ordinary, 61,319; slot, 121,243; fires, 15,296	21,941 9 6		47,974 6 7
Residual products—			
Coke, less £2525 7s. 6d. for cartage; £12,267 18s. 3d. for labour, &c.	£166,540 1 8		
Breeze, less £416 15s. 3d. for cartage; £3028 10s. 9d. for labour, &c.	6,843 10 2		
Tar, less £132 13s. 6d. for cartage; £178 7s. 1d. for labour, &c.	36,387 3 6		
Sulphate of ammonia, less £11,925 8s. for acid, &c.; £3862 2s. 1d. for labour, &c.	52,264 19 5		262,035 14 9
Rents receivable			1,895 6 5
Transfer fees			82 15 0
Total receipts			£969,146 8 3

Expenditure.

Manufacture of gas—			
Coal into store, including £25,142 4s. 1d. for labour	£338,780 13 9		
Purification, including £7097 17s. 11d. for labour	19,909 16 9		
Salaries of Engineer and Officers at works	12,503 16 4		
Wages (carbonizing)	57,280 10 1		
Repairs and maintenance of works and plant, including £55,157 10s. 10d. for labour, less £5105 2s. 5d. received for old materials	118,530 16 0		£547,005 12 11
Profit sharing for 12 months ended June 30, 1903	28,017 2 3		
Less on account	12,000 0 0		16,017 2 3
Distribution of gas—			
Repair, maintenance, and renewal of mains and service-pipes, including £4697 12s. 10d. for labour	£36,356 9 1		
Salaries and wages of officers, including Rental Clerks	14,661 0 6		
Repairing and renewals of meters, including £4728 12s. for labour	20,168 14 5		
Repairing and renewals of stoves, including £9315 17s. 4d. for labour	16,355 10 11		
Gas-fittings (labour)	4,679 8 0		92,221 2 11
Public lamps—			
Lighting and repairing, including £11,700 11s. 4d. for labour			15,846 6 10
Rents, rates, and taxes—			
Rents payable	£996 10 3		
Rates and taxes	37,956 2 5		38,952 12 8
Management—			
Directors' allowance	£2,528 15 0		
Salaries of Secretary, Accountant, and Clerks	3,226 3 1		
Collectors { Ordinary	5,146 5 6		
Collectors { Slot meter	5,734 0 6		
Stationery and printing	3,039 9 0		
General charges	6,174 16 1		
Company's Auditors	112 10 0		25,961 19 2
Law charges	£758 10 5		
Parliamentary charges	105 0 0		863 10 5
Bad debts			1,668 7 9
Pensions and officers' and workmen's superannuation, sick, and accident funds			5,164 7 3
Gas Referees and Official Auditor			356 15 1
Leasehold renewal fund			300 0 0
Total expenditure			£744,357 17 3
Balance carried to net revenue account			224,788 11 0
			£969,146 8 3

The net revenue account stands as follows:—

Balance from last account	£171,177 19 1
Less dividend for the half year ending Dec. 31, 1902	160,000 0 0
	£11,177 19 1
Amount from revenue account	224,788 11 0
Interest on bankers' balances	933 13 7
	£236,900 3 8
Interest on temporary loan and deposits	£2,746 2 10
,, on debenture stock	26,700 0 0
Amount carried to insurance fund	17,009 5 9
Balance applicable to dividend on the ordinary stock	190,444 15 1
	£236,900 3 8

Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on June 30 last were as follows: Reserve fund, £153,049; renewal fund, £23,472; insurance fund, £90,213.

The statements furnishing manufacturing details are as follows:—

Statement of Coal.

In Store Dec. 31, 1902.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1903.
Tons. 133,681	Tons. 480,573	Tons. 561,017	Tons. 890	Tons. 52,347

Statement of Residual Products.

Description.	In Store Dec. 31, 1902.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1903.
Coke—cwts.	155,699	6,943,247	1,921,815	5,063,013	114,118
Breeze—yards	5,785	145,965	32,907	116,113	2,730
Tar—gallons	344,443	5,834,438	66,474	5,823,009	289,398
Ammoniacal liquor—butts	50,408	166,688	184,271	..	32,825

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 5,997,267	Thousands. 169,731	Thousands. 5,616,538	Thousands. 5,875,439	19,022 incand't 3,065flatflame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £31,561; coke and breeze, £4964; tar, sulphate, and ammoniacal liquor, £14,370; and sundries, £230,015. The figures this time last year were: Coal, &c., £37,096; coke and breeze, £5957; tar, sulphate, and ammoniacal liquor, £10,849; and sundries, £220,667. A sum of £22,887, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £18,402. The figures this time last year were £18,288 and £13,019.

BRENTFORD GAS COMPANY.

The Half-Yearly Report and Accounts.

In the report which the Directors of this Company will present at the half-yearly meeting on Friday, they state that a steady increase in the consumption of gas in the six months ending June 30, amounting to 4·79 per cent. over that of the corresponding half of 1902, and enhanced receipts from residual products, were gratifying features of the working. They also express their pleasure in reporting that the ordinary consumers now number 26,134, and those on the automatic system 24,837; making a total of 50,971 They have for some time had in view the formation of an insurance fund, and they consider that such a fund should now be commenced. The works of the Company, under the supervision of Mr. James Husband, have been kept in efficient order. The accounts accompanying the report show that the sale of gas produced in the six months covered by them £145,999, compared with £139,382 in the corresponding period of last year; meter-rents came to £13,513, against £12,389; residuals produced £34,024, against £28,499; and the total revenue was £193,593, compared with £180,317. The expenditure on the manufacture of gas was £100,640, against £97,230; on distribution, £25,851, against £21,717; management cost £5369, compared with £5202; and the total was £146,393, against £139,253. The balance carried to the profit and loss account is £47,200, whereas this time last year it was £41,064. The amount available for distribution is £89,494; and the Directors recommend dividends at the rates of 5, 12, and 9 per cent. per annum on the preference, consolidated, and new stock. The working statements show that 75,225 tons of Newcastle coal and "solar" oil equal to 25,945 tons were used in the past half year in the production of 1,084,774,000 cubic feet of gas, of which 1,003,428,000 cubic feet were accounted for. The estimated quantities of residuals produced were: Coke, 47,466 tons; breeze, 5900 tons; tar, 817,658 gallons; and ammoniacal liquor, 21,260 butts.

STREET LIGHTING IN WESTMINSTER.

Comparative Cost of Electricity and Gas.

In previous issues of the "JOURNAL," reference has been made to the investigations of the City Engineer of Westminster (Mr. J. W. Bradley) into the capabilities and cost of the various illuminants employed in lighting the streets of the city; and in the issue for the 24th of February, we gave two tables embodying the results of his labours. We have just received his report for the quarter ending the 30th of June, and reproduce the principal figures, leaving them to speak for themselves.

Tests of Street-Lamps (Gas and Electric) with Statement of Comparative Costs.

Description and Position of Lamps.	Number of Lamps Tested.	Average Candle Power.	Capital Cost of Lamp.	Total Cost per Lamp per Annum.	Hours of Burning per Annum.	Total Cost per Candle Power per Hour.	Test No. 4. Total Cost per Candle Power per Annum.	Average Total Cost per Candle Power per Annum, including all Tests up to Date. (Four Series).
(1) Electric arcs, Northumberland Avenue (Charing Cross and Strand Electric Light Company)	6	590	£40	£30 0 0	3940	0·0031d.	*12·2d.*	11·35d.
(2) Electric arcs, Pall Mall (St. James' and Pall Mall Electric Light Company)	6	362	45	34 0 0	3879	0·00575	*22·7*	14.9
(3) Electric arcs, Grosvenor Gardens (Westminster Electric Supply Corporation)	6	576	—	22 0 0	3940	0·00234	*9·2*	8·57
(4) Refuge lanterns, four incandescent mantles, Victoria Street*	5	96	15	13 6 6	3940	0·00845	*33·3*	31·85‡
(5) Sugg's high-pressure lamps, Whitehall, incandescent mantles*	6	311	15	18 5 0	3940	0·00358	*14·1*	10·58
(6) Ordinary single burner, incandescent mantle, footway, Victoria Street*	6	34	6	3 10 0	3940	0·00627	*24·7*	18·30
(7) Ordinary flat-flame, footway in Whitehall, three burners, each 6·16 cubic feet per hour	6	57	8	5 18 2	†	0·00632	*37·33*	37·00
(8) Ordinary single burner, incandescent mantle, Carlton House Terrace*	5	33	6	2 17 11	3940	0·00536	*21·1*	19·8‡
(9) Ordinary flat-flame burners, footway, Chandos Street, Strand, three burners, each 5 cubic feet per hour.	6	44	8	9 8 10	3940	0·01307	*51·5*	47·65‡

* Some of the mantles in these cases were defective; and the attention of the Gaslight and Coke Company was called to those in Victoria Street and Carlton House Terrace, and of Messrs. W. Sugg and Co. to those in Whitehall. † The lamps burn for 2166½ hours before midnight, and 1773½ hours (at 5 cubic feet of gas per hour) after. ‡ Average of three series only.

EDINBURGH PUBLIC LIGHTING.

Report by Mr. Herring.

The minutes of the Works Committee submitted at the last meeting of the Edinburgh and Leith Gas Commissioners contained an interesting report by Mr. Herring on the public lighting.

The report commences by stating that in February, 1898, Mr. Herring expressed a desire to be allowed by the Corporations of Edinburgh and Leith to have an experimental display of incandescent gas lighting in some of the side streets; and installations were fitted up. Reporting upon these on April 9, 1900, Mr. Herring submitted a statement to the effect that the Commissioners could not supply and fit up lanterns, &c., at less than £3 0s. 6d. each, which cost was made up of: Lantern and cradle, £2 5s.; burner, 5s. 8d.; governor, 1s.; mantle, 10d.; and men's time fitting up, &c., 8s. Early in 1899 a scheme was propounded for the transfer and the upkeep, from the Town Council to the Gas Commissioners, of all lamps and appliances used in connection with the public lighting. This scheme offered certain improvements in the light to be yielded from the present 2 feet per hour lamps. It also included the supply of new lanterns throughout the city, and showed a saving to the city of £770 per annum. The proposal was approved by the Commissioners, but was not accepted by the Corporation of Edinburgh, as there appeared to be some difficulty as to the Corporation having the power to hand over to another statutory body their vested interests in the lamp columns and other public lighting appliances. Mr. Herring is still of opinion that a scheme founded on a similar basis would be the best and most practicable one to adopt. Whether or not the Corporation would allow their columns to stand, still remaining their property, but giving the Commissioners the use of them, or whether it would be preferable that the Commissioners should take over the whole of the lamp-columns at a valuation, with a guarantee that only those retained in their present positions should be paid for, is a matter of detail which can be easily adjusted. He most earnestly suggests, however, that the public lighting of the city, so far as gas is concerned, could be better done by the Gas Commissioners themselves, whose interest it is to light the city in the best possible way, and at the cheapest cost to the public. Hitherto, the Commissioners have supplied gas for the public lighting at bare cost price; and Mr. Herring founds the proposals which he makes on the assumption that the Commissioners are still desirous of serving the community in the way of public lighting at the net cost of the supply to themselves.

During the past five years, the average cost of each lamp to the Corporation has been 37s. 1d. per annum; this sum including the repair and maintenance, the lighting, cleaning, and extinguishing, and also the proportionate cost of any additional or new lamps that have been erected throughout the burgh during that period. Mr. Herring's first proposition is that the Gas Commissioners should undertake to supply any number of lamps in the future at the over-all price of 37s. each per annum, burning 2 cubic feet of gas per hour, and also undertake the repair, maintenance, and up-keep of the service-pipes, lamp-columns, lighting, cleaning, and extinguishing. In addition, the Commissioners should agree to supply all existing lamp-columns with a new type of lantern, of a class that would be suitable for improved flat-flame burners or incandescent mantles. As an alternative, he suggests that the Commissioners should allow the existing lamp-columns, service-pipes, &c., to remain strictly in the hands of the Corporation; the latter paying for their maintenance and up-keep, and also carry out the operation of cleaning, lighting, and extinguishing the lamps as at present, but the Commissioners to undertake to supply a new type of lantern suitable for either improved flat-flame or incandescent burners at an over-all rate of 25s. per lamp per annum, burning 2 cubic feet of gas per hour. The new type of lantern would afford a better protection to the burning flame, thereby enabling a different type of ordinary burner to be introduced into the public lamps on the present basis of 2 cubic feet of gas per hour consumption. This would yield 70 per cent. of the possible illuminating power of the gas supplied, as compared with the existing burner employed in the globe lanterns, yielding only 45 per cent. of the possible lighting power.

Referring to the question of incandescent lighting, Mr. Herring says: "The admitted success of the incandescent system for public lighting purposes, both at home and abroad, is conclusively proved by the fact that towns so different in character and so widely situated as Bradford, Lower Sydenham, Folkestone, Hull, Ipswich, Oxford, Plymouth, Ramsgate, and Richmond, have, for years past, exclusively

employed this system of public lighting to the exclusion of all flat-flame lighting, and in many instances of electric arc lighting. The Continent of Europe also tells the same story, as Berlin, Frankfort, Hanover, Hamburg, and many other cities use incandescent gas lighting to the exclusion of the ordinary method, and in many cases supplant the electric arc lighting, which makes it easy for me to strongly recommend the adoption of this system in the city of Edinburgh and the burgh of Leith. Two important conditions, however, must at first be granted—firstly, that a new type of lantern is absolutely essential to afford the necessary protection to the mantle and the flame; and, secondly, that the care of the lamps, so far as the lighting, cleaning, extinguishing, and the repair and maintenance of the same are concerned, must be exclusively in the care of skilled men employed by the Commissioners, and accustomed to the handling of these comparatively delicate appliances. Assuming that these conditions are admitted, my second proposition is that the Commissioners should undertake to supply, grouped in sufficient numbers in different localities to require the services of one man for their attention, incandescent burners of a guaranteed illuminating power of 110 candles, including the lighting, cleaning, extinguishing, renewal of mantles, and general up-keep of columns and service-pipe, and all that appertains to a public lamp, at the over-all rate of 55s. per lamp per annum." This would enable a comparison to be made between the present electrically lighted streets of Edinburgh and high-power gas-lighted thoroughfares. The present gas-lamps throughout the city are well spaced to enable it to be done; and no capital outlay would be incurred in altering the lamp-columns, nor would the streets and highways be in any way disturbed by the laying of new pipes or other underground work.

Mr. Herring also makes the following third proposition: "It is admitted by all public authorities that the best illuminating effect is obtained by a judicious distribution of comparatively small-power lamps, rather than by the concentration of high-power lamps at less frequent centres. The finest examples of this system are to be found in Paris, Berlin, Amsterdam, Cologne, and, in fact, one might say, in all important towns and cities on the Continent of Europe, where incandescent street lighting may be said to reign supreme. In order, however, that a comparison may be made between the present electrically lighted streets of Edinburgh and high-power gas-lighted thoroughfares, I have gone carefully into the matter; and I am prepared to advise the Commissioners to offer to supply lamps yielding an equal illuminating power to that given by the present electric arc lamps, including up-keep, lighting, cleaning, extinguishing, &c., at £10 per lamp per annum."

The Works Committee agreed to take up the report on an early date.

We are informed by Mr. A. Cooke, the Secretary of the Midland Association of Gas Managers, that a capital photograph of the members grouped at Craigside, Rugby, was taken by Mr. G. A. Dean, of that town, from whom copies may be obtained—price 3s. each, and postage.

GAS TESTING IN WEST HAM.

The Test-Burner Question.

At the Meeting of the West Ham Corporation on Tuesday, a question arose as to the proper burner to be used for testing the gas of the West Ham Gas Company. It came up on a report presented by the Gas Examiner, in the course of which he stated that at the new testing-place in the Leytonstone Road on the 29th and 30th of June the illuminating power of the gas was 15·2 and 14·5 candles. The test-burner provided was a 15-hole argand with a 7-inch chimney, and not the "London" argand, with 24 holes and 6-inch chimney. He said the latter burner had hitherto been provided, and, in his opinion, was the legal test-burner in the Company's case. The effect of the substitution was to enable the Company to escape the penalty for supplying gas of 13-candle power tested by the proper standard burner, as such gas would be of 14-candle power tested by the burner at present fitted in the photometer. He requested the Company's Engineer to furnish him with the proper burner, but was informed that the Company contended that they were acting within their rights in requiring him to use the burner provided. Under these circumstances, he asked for instructions in the matter. On the 8th ult. he reported that he had examined the Company's gas on the two preceding days, and found the illuminating power on the former day to be 16 candles, and on the latter 15 candles. He explained that the testings for illuminating power were made by one of Sugg's 15-hole argand burners, with 7-inch chimney; the "legal test-burner" not being provided for his use. After hearing the opinion of the Town Clerk on the point raised, it was resolved to call upon the Gas Company to put up at the testing-station a burner similar to that prescribed for use in the Metropolis.

Public Lighting at West Bromwich.—The Highway Committee of the West Bromwich Corporation have issued a report with reference to the recent test carried out in the main thoroughfare of the borough to decide whether gas or electricity should be adopted for lighting the tramway poles. The Borough Surveyor had reported upon the quotations sent in; and the Committee recommend that electric lighting, by means of two 1000 candle power arc lamps on alternate poles, should be adopted in a portion of the town specified, and the existing gas-lamps removed. The net cost will be £600 per annum, to include fixing, lighting, and maintenance. They further recommend, with a view to the prevention of accidents and for the better lighting of the streets, that an incandescent gas-lamp should be placed on the footpath on each side of the street alternately, opposite each centre pole, so as to render them easily visible at night. The cost of the rearrangement of the existing lamps, the provision of some new ones, and fixing an incandescent burner to each when required, is estimated at £150.

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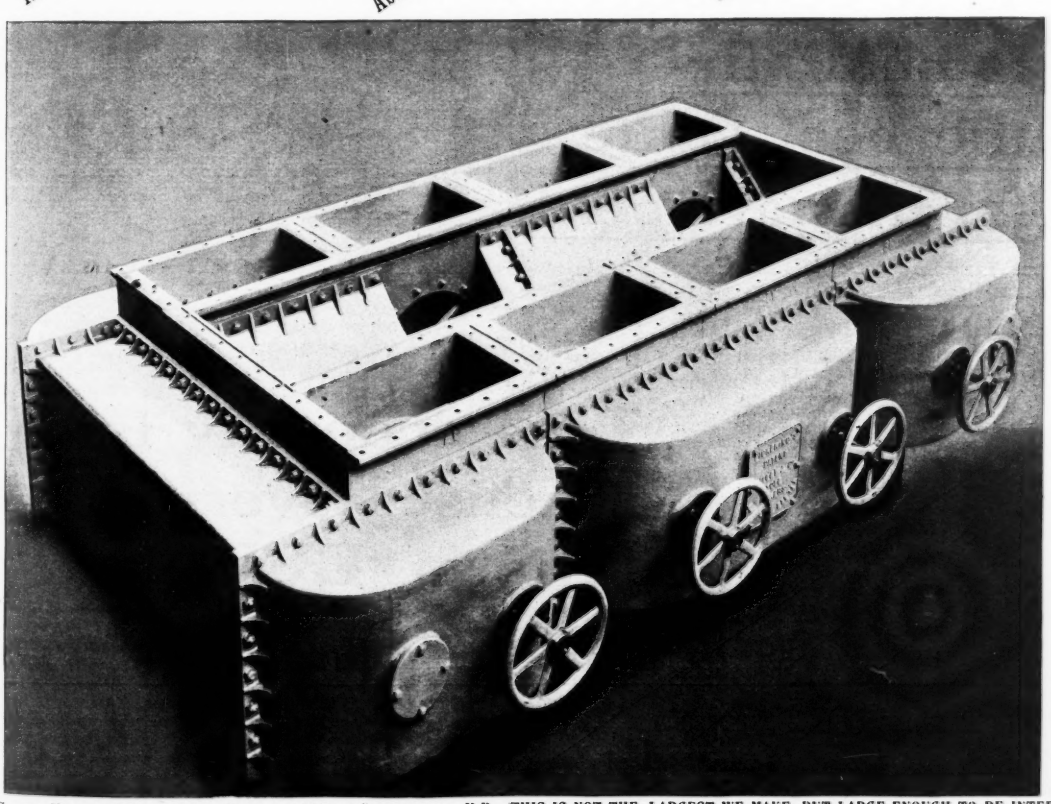

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CHEAPER GAS FOR BIRMINGHAM.

The Committee's Recommendations Adopted.

At the Quarterly Meeting of the Birmingham City Council last Tuesday, a long discussion took place with regard to the proposal of the Gas Committee that the price of gas should be reduced. The Committee recommended the following charges: For consumption per quarter in one premises, under 50,000 cubic feet, 2s. 6d. per 1000; 50,000 to 250,000 cubic feet, 2s. 3d.; 250,000 to 1,000,000 cubic feet, 2s.; and 1,000,000 cubic feet and upwards, 1s. 10d.—less the usual discount of 5 per cent. for prompt payment in each case. The Committee further recommended the discontinuance of the hire charge for small cooking-stoves to consumers of gas through prepayment meters.

Mr. BISHOP, the Chairman of the Gas Committee, in presenting the recommendations, reminded the Council of the large rise in the price of coal three years ago, which was equivalent to an increase in the cost of gas of nearly 6d. per 1000 cubic feet. The Committee at that time, however, only suggested a rise of 3d., partly because they believed the abnormal charge for coal would not be of long continuance, and still more because they were anxious to do nothing to check the use of gas for power purposes. Coal had now gone down; and he thought, on the contracts lately made, and on the estimate of savings in other directions, they were quite able to recommend reductions in price. The Committee had been able to buy a high class of coal this year; and they expected a largely increased yield per ton carbonized, and that the coke would be better. Therefore they felt themselves able to offer the reduction, with the full conviction that at the end of the municipal year they would still have a satisfactory surplus to hand over to the rates. Referring to the figures bearing on the working since 1875, he held that what was expected when the concern was taken over—that the Corporation would be able to supply cheaper gas than the Companies—had been realized. During the sixteen years ending March last, the consumption of gas by the general body of consumers advanced from 1675 million cubic feet to 2512 millions, which was an increase of 50 per cent.; while the consumption of the few large customers increased from 1512 million cubic feet to 3329 millions, or 120 per cent. This, he suggested, proved that that class of consumer, though small in number, had been the back-bone of the undertaking. Having regard to the competition of producer gas, the Committee felt they should take every legitimate means to preserve and extend where possible that important part of the business of the department. In 1898, the charges made secured a reduction of only 1d. per 1000 cubic feet to 90 per cent. of the consumers and of 3d. to the remaining 10 per cent. The proposal now made was very much more favourable to the whole class of consumers, because it would secure to nearly 90 per cent. of them a reduction of from 3d. to 5d. per 1000 cubic feet, in which both the smallest and the largest consumers would participate. As to an amendment to be proposed by Mr. Stevens, he admitted that it would have been easier to have adopted his recommendations; but the Committee had not done so because they believed they saw a better way—a way of encouraging and developing the enormous use of gas by the few great manufacturers. This they could not do if they adopted Mr. Stevens's resolution, and took off 3d. all round. The funds would not go to it. If they lost those large consumers, the dead charges would go on to the general body of consumers, instead of being spread over so large an area. The big consumers were so few that if they ceased to use the gas there would not be a meter inspector less required. It had been said that the calorific power of Birmingham gas was not equal to that of Manchester, and that therefore the price in Birmingham ought to be 1s. 9d. per 1000 cubic feet. It was singular that on the morning of the day that Mr. Chamberlain made his speech, the Finance Sub-Committee adopted the recommendations now being brought forward. The Gas Committee, in fact, anticipated Mr. Chamberlain's suggestion. They fixed the price for large consumers at 1s. 10d. per 1000 cubic feet; but it had to be remembered that there was 5 per cent. discount, whereas Manchester prices were net. He thought, therefore, they might adopt Mr. Chamberlain's remarks in support of their recommendation. But they were not influenced by anyone; their suggestions were the result of consideration of the commercial aspect of the question. Their object had not been to benefit one class or another, but to sell gas at the best prices.

Mr. STEVENS moved, as an amendment, that, from September next, the charges should be the same as was the case from 1898 to 1900—namely, under 25,000 cubic feet per quarter 2s. 6d. per 1000 cubic feet; 25,000 to 50,000 feet, 2s. 4d.; 50,000 to 250,000 feet, 2s. 2d.; 250,000 cubic feet and upwards, 2s.—less the usual discount of 5 per cent. for prompt payments—and that for prepayment meters, where the Corporation supplied gas-fittings the charge should be 26 cubic feet a penny, and where the consumers provide their own fittings 31 feet a penny. He contended that the proposals of the Committee could not be defended on any principle of commercial equity. It seemed to him that the new scale was simply worked out by rule of thumb. His proposal was financially sound, as the estimated balance available (after making all provision for interest, sinking fund, and a contribution of £35,000 to the improvement rate) was £50,800. To reduce the price of gas by 3d. as he proposed, and 1d. per 1000 cubic feet for public lighting, would absorb £48,000, leaving a surplus of £2800; so that his suggestion would not involve the Committee in any financial embarrassment. The Committee's scheme would adversely affect a large number of small and large shopkeepers, and small and large manufacturers. Those who consumed up to 25,000 cubic feet, except the prepayment consumers, would get the full reduction of 3d. per 1000 cubic feet; those above 25,000 and up to 50,000 feet, would only get 1d. reduction; those from 50,000 to 250,000 feet, would get 2d. reduction; those from 250,000 to 1,000,000 feet, would get 3d.; and those above 1,000,000 feet would get 5d. This meant a difference of 8d. per 1000 cubic feet between the minimum and maximum; and that, he contended, was altogether unwarranted. The proposal to take 1 cubic foot per penny from

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the prepayment meter consumers he characterized as "nibbling" from the small consumers to give to the large. The reason for the creation of a 1s. 10d. rate was that it would keep the large consumers, who used gas for power purposes. He differed from this idea altogether. He did not believe they would be able to permanently retain these large consumers, because gas for power could be produced at 1s. per 1000 cubic feet; and these people would not continue to pay 1s. 10d. for what they could get for 1s. The difference in rates, he urged, should only be the extra cost of distribution and management; and he further pointed out that many large consumers did not use the gas for power purposes. Indeed, more than half the gas used for power was taken by those who consumed less than 1,000,000 cubic feet per quarter.

Mr. KEEGAN, who seconded the amendment, said he thought it unfair that the Gas Committee should take out of reckoning the great number of small consumers, especially those who had prepayment meters. Then there was an enormous body of shopkeepers, who were being sacrificed for the benefit of the very few large consumers.

Mr. WALTHALL agreed with the Committee so far as the proposal affecting the large consumers was concerned; they certainly should have a benefit. But under the revised scale, the charge for prepayment meters was 3s. 4d. per 1000 cubic feet. Small consumers, who had their own meters, were only charged 2s. 6d.; so that to the very poorest of the poor the Committee were charging 10d. per 1000 cubic feet more for the extra expense of collection. He was told the additional expense of these prepayment meters was 7d. per 1000 cubic feet, so that they were charging the poor people 3d. more for their gas, which was unfair.

Mr. DAVIS said he had received many letters from local gas-fitters protesting against the discontinuance of the hire charge for small cooking stoves. He had looked into the matter, and had come to the conclusion that the traders in the city were right in their contention that this was unfair competition on the part of the Corporation. He had never seen any reason why they should supply fittings to persons using gas, though they might do so on perfectly fair lines. What the Committee suggested now was to take away from the traders the power to supply these articles, because they proposed to discontinue the charge for hire.

Other members having spoken in support of the amendment,

Alderman LLOYD, who said he was one of the minority on the Gas Committee, mentioned that to his mind the question was simply this—whether having raised the price three years ago 3d. per 1000 cubic feet, they ought not now, when an opportunity had come to make a reduction, to take off the same amount before making any other alterations. They ought to be just to their old consumers, before being generous to the large ones.

Alderman CLAYTON said the last speaker had raised a serious question of principle which no commercial undertaking would permit—viz., that because they had differentiated between consumers of 25,000 and 50,000 cubic feet in the past, they were to have a vested interest in this difference for all time. The Gas Committee came before the Council, not to advocate the cause of any class of consumers, but to look at the question from the commercial point of view. They proposed 1s. 10d. per 1000 cubic feet for large consumers simply because they wanted to keep them. If they did keep them, the Committee would save a difficulty with the other classes of consumers. If the business of the 6 per cent. of large consumers were lost to the department, it would be necessary for the small consumer to pay extra.

Alderman LAWLEY PARKER was in agreement with the Committee on the scale of charges, with a single exception. He could not help thinking it a little mean to take 1 cubic foot off the prepayment meter consumers. It seemed hardly worth doing. It created a grievance, and only amounted to £1356 per annum. He appealed to the Chairman of the Committee to allow the prepayment consumers to have 26 cubic feet for their penny, as before.

The LORD MAYOR expressed a hope that the Council would pause before throwing out the recommendation of the Committee. If they considered the figures, they would see that 94 per cent. of the consumers did not burn half the gas, but that the remaining 6 per cent. consumed 57 per cent. No new principle was involved. He was convinced that they were now saving the prepayment consumer 4s. 4d. a year; and he could not see where the hardship to the gas-fitter came in.

Mr. BISHOP expressed his willingness to accept Alderman Parker's suggestion. With regard to the desire to keep the large consumer, he mentioned that the Committee had knowledge of some manufacturers who were already putting down producing plants. As to municipal trading, he pointed out that the Fittings Department was taken over by the Corporation; and they had never really increased it beyond the natural growth of the concern. The Committee had never desired to interfere, or to compete, with the gas-fitters of the town. As proof of his assertion that the Corporation were not injuring the tradesmen, he pointed to the figures of a firm who, five years ago, made an effort to supply gas cookers, grillers, and sundries, and who employed sixteen travellers throughout the country, and had 9000 customers.

On a vote being taken the amendment was lost—19 voting in its favour and 34 against. Thereafter the resolution of the Committee was agreed to.

On the motion for the adoption of the report,

Mr. BISHOP referred to the failure of the Committee to secure the right to establish gas-works at Birches Green. They would now set on foot the necessary inquiries, and would do all they possibly could to secure another site. The decision of the Gas Committee, arrived at in 1901, after full inquiry, that Birches Green was a most suitable site, was in no way shaken by the evidence given against them in London; and in the way of warning to any speculative builder who might have inclinations to purchase the land, he added that, supposing the best endeavours of the Committee failed, and they did not succeed in securing another suitable site, it was not improbable that they would go before another Committee of the House of Commons, and ask them for permission to use it.

The adoption of the report was then formally agreed to.

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BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	ACCRINGTON	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	25,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
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Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . . 1,800,000 Cub. Ft.

BROUGHTY FERRY CORPORATION GAS-WORKS.

Mr. Waddell's Defence.

Mr. Forbes Waddell, the Manager of the Broughty Ferry Corporation Gas-Works, has addressed the following letter and statement to the Editor of the "Dundee Advertiser," with reference to the report of Mr. Herring on the condition of the works (*ante*, p. 254).

Sir,—Last week you published in full the report of Mr. Herring, Gas Manager, Edinburgh, as to the state of Broughty Ferry Gas-Works. That published report in the newspapers was the first I had seen of it. No copy of the report previous to publication in the newspapers was sent, nor was any question or explanation asked from me. As the report and the motion tabled therewith may have far-reaching effect upon my life and career as a gas manager, surely I should be allowed an opportunity of stating my case.

I beg of you to give the enclosed statement the same publicity as Mr. Herring's report, so that anyone with an unbiased mind can judge between the two. By so doing, you will greatly oblige, yours sincerely,

FORBES WADDELL.

Broughty Ferry, July 29, 1903.

MR. WADDELL'S STATEMENT.

Broughty Ferry gas trouble has been the result, to more than half its extent, of a blunder for which I consider Mr. Morrison, the Treasurer, is to a great extent responsible, and by the unfavourable results of the past year. By his error, it was made to appear possible to sell gas at 2s. 6d. per 1000 cubic feet; and that was before my time. The working results of the year ending 1902 are taken as a criterion by the expert, presumably because, with all his advantages, his are about 7½d. per 1000 cubic feet worse than mine for that year.

Indeed, if Edinburgh cost of production for the year just closed is compared with the cost of production in Broughty Ferry—even in this unfavourable year—there does not seem to be any cause for grumbling about practical results, for our cost for coal and oil, purifying, and wages, less residuals, is only 1½d. per 1000 cubic feet more than Edinburgh, when allowance is made for carriage. That unfair comparison—a number of groundless complaints by councillors made, not in Council, but on the street, and concentrating on this past year the inherited legacy, have given an opportunity, to the section who desired it, to drive the knife home.

It may be asked what has made this year so bad compared with the previous? Well, I have to admit that the results are not so good; but, as already stated, the bad debt has been carried forward, and during the year I had to design, plan, and specify, and superintend the erection of, the new plant in addition to every-day routine. Mr. Herring would have special men for carrying out that work.

It was, however, resolved to call him in at the worst possible time; and what are his qualifications? Though Edinburgh is practically in the coalfields, and is a wholesale concern compared with Broughty Ferry, his cost of coal and oil, purifying, and wages, less residuals, compare with Broughty Ferry thus: Average cost of production for three years ending 1902: Edinburgh, 1s. 6·9d. per 1000 cubic feet. Broughty Ferry, 1s. 2·22d. per 1000 cubic feet—4·68d. per 1000 in favour of Broughty Ferry.

Again, for the year taken as a standard by the expert, my results are 7·43d. per 1000 cubic feet better than his. Why does he not take his own as a standard? Over the past four years' working, the cost of production in Broughty Ferry is much less than in Edinburgh. The quantity of coke sold by Edinburgh, as obtained from the Edinburgh accounts published by the "Gas World," is, on the average for three years ending 1902, 3·85 cwt. per ton of coal. For Broughty Ferry, it is 9·75 cwt. per ton of coal—Broughty Ferry nearly 6 cwt. better than Edinburgh. His report mis-states the make of gas per ton, and the quantity of coke sold per ton. He writes instructions which are absurd and impossible. Fancy him, after having had ample time to think over things, instructing us to put into the same size of oven more 9-inch walls than we had 4½-inch walls, and at the same time to leave greater spaces between those walls. Those instructions have, of course, been altered. Then he demanded 90 per cent. of silica in the materials required; and we cannot get the firm to undertake such.

He refused to put blame on English retorts, which I have found, on my first trial, to be soft. He whispers a lot of things about Broughty Ferry; and I consider he puts things in the worst possible light—worse than they are—while he omits everything in the way of saving clauses. Brotherly! That report was first read by me in the newspapers, and, while a notice of motion to dismiss me has been given, the Council have not yet permitted or asked me to state my side of the question—justice! I have, instead, been again and again pressed to resign. I have done better than the expert, with the exception of this past year; and the confusion and extra work surely are sufficient reason.

The new plant, it is admitted, even by the expert, will effect a great saving; but it is considered by some necessary to get a successor who would have nothing to look after but routine work, and who could hardly help making the good results for which I surely should get credit. This drastic proposal by a section of the Council means for me not only a blighted career as a gas manager, but hurt to a patent, which has done well in all the places into which it has been introduced, and has not been objected to, even by Mr. Herring, though the impression seems to have got abroad that my own special arrangement is at fault. One year's results unfavourable, but yet not unfavourable when compared with places outside Broughty Ferry; and two years' results before that much better than other places, are my record. What have I to resign for?

The Directors of the Gas, Water, and General Investment Trust, Limited, have declared interim dividends at the rate of 4½ per cent. per annum on the preferred stock and 3 per cent. on the deferred stock.

SO GLAD!!!

This is my last season,

LITTLE'S PATENT

HOT COKE CARRIER

will be universally adopted in

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NEW CONVEYOR COMPANY, LIMITED,

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SALFORD CORPORATION GAS SUPPLY.

The Past Year's Working.

We have received from the Gas Engineer and Manager to the Salford Corporation (Mr. W. W. Woodward) the report of the Gas Committee, accompanied by the accounts of the gas undertaking for the year ended the 31st of March. The Committee express their pleasure in reporting that, notwithstanding the exceptionally mild weather during the past winter, the sales of gas only fell off to the extent of 0·76 per cent. for the financial year. There was, however, a considerable increase in the number of consumers in this period. The coal and cannel carbonized during the year amounted to 151,488 tons, and the quantity of gas made was 1,553,231,000 cubic feet, of an average illuminating power equal to 19·65 candles—the parliamentary standard being 18 candles within the borough, and 17 candles as tested in the out-districts. The cost of coal was less than in the previous year. The market for residuals showed improved results for tar and sulphate of ammonia; but the receipts from the sale of coke were slightly less. The works and plant were maintained in a thoroughly efficient condition throughout the year, and extensive coke-conveying, screening, and storage machinery was erected at Albion Street. The discount of 2d. per 1000 cubic feet, allowed on all accounts paid within one month of delivery, was increased to 4d. on July 1, 1902; and the price was further reduced to large consumers. The more favourable terms obtained in purchasing the coal for the current year enabled the Committee to recommend a further reduction of 2d. per 1000 cubic feet to all ordinary consumers, and a reduction of 3d. per 1000 cubic feet to consumers of 250,000 cubic feet and upwards per quarter.

The accounts show that a sum of £20,566 was expended for capital purposes in the past financial year; £8142 being on buildings and plant, £4709 on mains and service-pipes, and £6376 on prepayment meters. The sale of gas to private consumers resulted in a revenue of £186,879; for public lighting, £15,036—together, £201,915, or, with the discounts deducted, £183,182. Residuals produced £57,912; and the total receipts were £243,891. The expenditure on the manufacture of gas was £129,183, including £87,080 for coals, £23,037 for carbonization, and £15,085 for repairs and renewals; on distribution, £11,824; and on management, £6301. Bad debts to the amount of £1056 were written off; making the total on the expenditure side of the revenue account £163,488, and leaving £80,403 to go to the profit and loss account. After payment of the interest and redemption charges, and transferring £15,000 to the accounts for the depreciation of works and plant, meters, and stoves, the net profit for the year (placed to the district fund account) is £30,601.

The work of the United States Patent Office during the past year was in every way remarkable. The number of patents issued amounted to 29,329, whereas the previous year's patents numbered only 26,031.

THE DUBLIN ELECTRIC LIGHTING SCHEME.

The Supervision of the Undertaking.

The Corporation of Dublin had a special meeting last Wednesday, for the purpose of considering a report made by the Committee of the Whole House, recommending the acceptance of the terms and conditions under which Mr. Robert Hammond will, for a period of twelve months, supervise the operation of the extended electric lighting undertaking. The Right Hon. Lord Mayor (Mr. T. C. Harrington, M.P.) presided; and, in moving the adoption of the report, explained that they were establishing practically a new system of electric lighting in Dublin; and it was deemed to be a wise course for the Council, in order to prevent risk, to entrust the Engineer who had had charge of the scheme up to the present with carrying on the undertaking for the first months of its working. This was the principle embodied in the report. There was an idea prevalent that the Engineer was responsible, under his agreement, for the running of the scheme for some months after its completion; but this was not so. The Committee proposed to enter into a fresh agreement with him, by which, for 1000 guineas and travelling expenses, he should undertake the responsibility for working the new plant for a period of not less than twelve months. It was for the Council to say whether or not this was a wise bargain to make. It was of the utmost importance that the scheme should be worked well and economically; for it was desirable that the smallest possible burden should fall on the general body of the ratepayers. He could not promise in the immediate future that the scheme, however economically worked, might not be something of a charge upon them. But in retaining the services of Mr. Hammond, they were doing the best thing to secure a large proportion of public support.

The motion gave rise to a long discussion; objection being taken to giving Mr. Hammond power to make appointments outside the control of the Council. Eventually an amendment was proposed making it incumbent upon him to submit to the Council the names of his proposed staff, and the salaries to be paid—the Council to have power to veto any of the appointments. On being put, however, it was lost; and subsequently the report was adopted by 30 votes to 9.

The Corporation have not been happy in this business. The scheme was commenced on an estimate of £250,000 as the cost; and it has actually entailed an outlay of £300,000. Now, before it can be set to work, a further outlay of £1050, exclusive of the travelling and hotel expenses of the Engineer and his staff, will have to be incurred. For this the citizens have between 400 and 500 arc lamps, the current for which is to be charged to the Paving and Lighting Committee at the rate of £25 per lamp per annum. The result will be that in the accounts of the Electric Light Committee a sum of upwards of £11,000 will appear every year, instead of about £2000 now annually paid for gas. At this rate, the electric lighting of Dublin will prove a very expensive luxury.

WALKER'S PATENT

SULPHATE OF AMMONIA PLANT

Recovers the WHOLE of the Ammonia.

SULPHUR RECOVERY PLANT

For Recovering the Sulphur from Waste Gases of Saturator.

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DEWSBURY CORPORATION GAS AND WATER SUPPLY.

The Annual Accounts.

In the "JOURNAL" last week, we gave a few figures from the recently issued abstract of the accounts of the Dewsbury Corporation for the year ending March 31. We now extract those relating specially to the gas and water undertakings. The total revenue arising from the supply of gas amounted to £36,225, which included £25,252 from the sale of 169,899,200 cubic feet, £2091 from prepayment meters, £837 from meter and stove rents, and £8336 from the sale of residual products. The expenditure included £15,194 for the manufacture of gas, £1833 for distribution, £1338 for general management, £3557 for rents, rates, taxes, and insurance, £6237 for interest, and £2781 for the payment to the sinking fund. The profits amounted to £4897, of which sum £500 has been transferred to the contingent fund, and the balance added to the revenue surplus. From the latter fund, £1500 has been paid into the district rate account, and £1474 into the water-rate account. During the past year, the sulphate plant at the gas-works was reconstructed, and the cost, amounting to £1173, taken out of the revenue account. The Gas Committee light the public lamps; but no credit is taken for this. The revenue surplus account now amounts to £5152; and the contingent fund to £3074. In the balance-sheet, the assets are put down at £265,771, and the liabilities at £191,239; leaving a surplus of £74,532. On the water revenue account, the income is shown as £14,817, and the expenditure as £16,840; leaving a deficit of £2023. The liabilities are put down at £285,249, and the assets at £387,539; showing a surplus of £102,290.

CHELMSFORD WATER SUPPLY.

Local Government Board Inquiry.

Last Friday week, Mr. W. A. Ducat held an inquiry on behalf of the Local Government Board into an application by the Chelmsford Town Council for permission to borrow £16,000 for water supply purposes, including the construction of a new reservoir, with a capacity of 670,000 gallons, at Long Stomps. Of the sum named, £9400 was required for permanent plant at the new well in the Mildmay Yard, and the balance for the reservoir. Several members of the Council appeared to oppose the scheme. The Town Clerk (Mr. T. Dixon) having explained how matters stood, Dr. J. C. Thresh, the Medical Officer for the county, said his suggestion had been that there should be two bores, one at the present site and one at Admiral's Park; his opinion being that a sufficient yield would thus be obtained for many years to come. From these two sources, he thought they would get about 400,000 gallons per day, which would give 30 gallons per head per day. The quality of the water from the new bore left nothing to be desired. He was strongly in favour of the present scheme, and felt that an abundant supply could be obtained at a far less cost than by sinking a deep well and driving adits. Owing to the mains being old, he believed there was a very large amount of water running to waste; and the first thing the Council should do would be to have the pipes examined. The water at the present new bore was derived from the Thanet sands, though it came through the chalk, and was generally supposed to come from the chalk. He regretted to say that the water in Essex from the Thanet sand was sinking at the rate of about a foot a year; but, of course, it would take a long time to exhaust the supply. He did not say he considered it useless to bore lower than the level of the chalk. It had been bored through at Loughton, where they sank a well 1000 feet deep, and went into the green sand and lost what little water they got from the chalk. At Saffron Walden, they sank a well 1000 feet deep; but they had to sink another recently, because the deeper they went the less water they obtained. Asked whether he thought the result would be the same at Chelmsford, Dr. Thresh said he should certainly not advise them to risk such a well when there was a fair possibility of getting a good supply without it. Mr. Percy Griffith, who is advising the Council on the subject, said he was called in during November, 1901. In his view, the importance of the tests carried out last year at the trial-bore was not so much in the quantity raised as in the data he obtained. The most important factor had been the water-level in the boring. When the pump was stopped, the water rose 30 feet in 15 minutes, and 60 feet in eight hours. This happened on two occasions during the test; the water rising steadily and definitely. A portion of the supply which was required from this particular source had been maintained since the first test; and for at least two years a large proportion of the water for the town had been derived from this boring. It could not be dispensed with at the present moment. During that period, a great deal had been said about getting for temporary purposes 10,000 gallons an hour; but there was a difference between a temporary and a permanent plant. The essential point had not been to pump 10,000 gallons an hour, but to keep the town supplied. It was urgent that proper machinery of a permanent type should be put down at once. Asked how it was that at the present time they got only about 6000 gallons an hour, when they were promised 10,000 gallons, Mr. Griffith replied that it was due to the fact that they had been endeavouring to produce this result with plant of a temporary character. Alderman Maskell: Why cannot you put down some temporary machinery to satisfy us that there are 10,000 gallons an hour to be raised? Mr. Griffith: I have done my best. I acknowledge that I have not been successful; but to have procured the necessary machinery would have involved an enormous expense, though I am afraid that that will yet have to be faced. Alderman Maskell: We have spent an enormous sum in providing temporary machinery. Do not you think a larger supply would be obtained by continuing this bore to the green sand? Mr. Griffith: I should very strongly hesitate to go to such a

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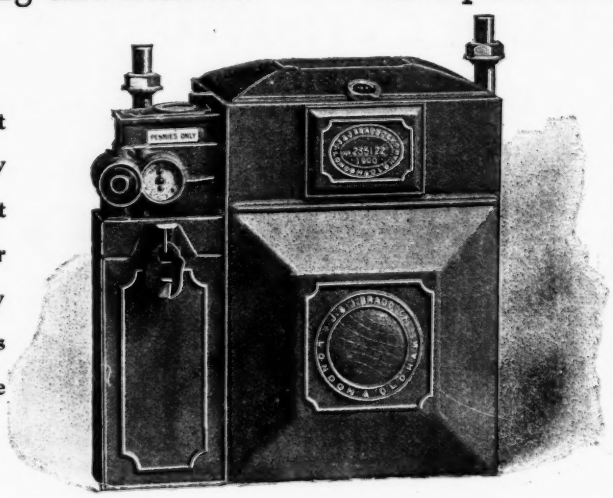

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depth, when there is a prospect, and a good prospect, of obtaining it where you are. The Mayor (Alderman G. W. Taylor) read some figures of the late Surveyor showing how the water at the old well at the Mildmay Road works had fallen so much that the well could be emptied in 2½ hours in 1893. In May, 1894 and 1895, the well could be pumped out in 1¾ hours. Then the present bore was sunk; and he (the Mayor) had every confidence that, with proper machinery, they would be able to get a greatly increased supply from the well. In May last, the late Surveyor reported that the water pumped averaged 8200 gallons an hour, and that the supply was far greater, and was continued for a much longer period, than for years past. Alderman Chancellor (the Deputy-Mayor) said he opposed what had been done with regard to the new bore, as he considered they had proceeded on wrong lines. As a matter of fact, pumping from the new bore rendered the old well in Mildmay Yard perfectly useless. The test of the new bore was unsatisfactory, for they could not obtain more than 6000 gallons an hour. Taking into consideration the present population and the likely increase, this proposed scheme, with other sources, would not be anything like enough to meet the requirements of the town. They had already paid over £4000 in experiments; and he could come to no other conclusion than that to carry out the proposed scheme would be a waste of the ratepayers' money. He advocated a deep well. Other evidence in opposition was given; and at the close of the inquiry the Inspector visited the new bore.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners on Monday adopted a recommendation by the Finance and Law Committee as to the disposal of the surplus upon the accounts for the past year. This was that they should make the minimum contributions to the sinking funds of £8837 for redemption of borrowed money, and of £7023 for redemption of annuities; and that, in addition to placing the statutory sum of £261 to the newly created reserve fund, they should transfer the balance of £4759 to that fund. This having been done, the Commissioners authorized Lord Provost Sir James Steel to certify the annual accounts to be correct, and they reappointed the Auditor—Mr. H. Kenward Shiells, Chartered Accountant—at a fee of £150 for the year. Mr. D. Purves, the Convener of the Works Committee, stated that a letter had been received from their friends of the Manchester Corporation, who were anxious to visit the new works at Granton. The Granton Works Sub-Committee were empowered to arrange for the reception of the visitors. Mr. Purves reported that everything was going on well at Granton. The works which had been undertaken during the summer were very far advanced, and they looked forward to being able to supply gas in a satisfactory manner during the winter season.

The Commissioners approved of a proposal of the Engineer, arising out of a report by him to the effect that a considerable number of gas-meters are in premises where gas has ceased to be used, and he suggested that he should send a circular to the occupiers of those premises, stating that the meters would be removed unless they were agreeable to pay rent for them. These are almost exclusively meters in houses which are now lighted by electricity. They are kept in, in order that the gas supply may be used as a stand-by, which is unfair to the Gas Commissioners, whose capital has been employed to provide the meters, and who derive no revenue from them. The Commissioners took powers, in their Provisional Order of 1902, to do what they are now about to do. They do not charge rent for meters where gas is burnt; but now they are going to charge people who do not use gas. It is somewhat paradoxical to say that a householder is not to be charged rent if he uses an article, but that he is to be charged if he does not use it. Of course, the reply is that if he does not use a meter he should return it; and that if he does not return it, he should pay the owners of the meter a sum equal to the maintenance and depreciation of the article. It is likely that the paradoxical side will appeal most strongly to those who are to be dealt with; and therefore we may expect to hear growls and protests soon.

Two Gas Managers were appointed in Scotland on Monday, which is larger by 50 per cent. than the average for one day since I recollect. In obtaining the post of Manager at Falkirk, Mr. William M'Crae is to be congratulated upon being again able to buckle on his harness in the occupation to which he has been bred. He will find much to do in Falkirk; and it is to be hoped that he will be able to take the members of the Corporation along with him in anything he may propose. They have not been noted for giving ear to the voice of the Manager; and his knowledge of this may be of assistance to him, in enabling him so to deal with his employers as to obtain their confidence. It must be added that circumstances would seem to favour him, for the divisions in the Town Council, being founded upon nothing which anyone can understand, it is only reasonable to have expected that, whether there had been a change in the management or not, the folly of their past deeds must surely soon have dawned upon the contestants, and that an era of peace was at hand. Let us hope that this is so. The appointment of Mr. Andrew Thomson to succeed his father in Inverness is the best tribute which could be paid to the memory of the late Manager. Mr. Thomson has been Assistant at Inverness for some time, and knows the work thoroughly. But his father, like a wise man, did not essay to train him himself, but sent him first into the railway engineering shops in Inverness, and afterwards to Edinburgh, whence he himself had emanated; and in the gas works there the young man had opportunities for study, scholastic as well as practical, which he could not have got at home. This is the second post of Gas Manager in Scotland which has been filled up within a month by the promotion of a son to a father's place,

THE

MAXIM PATENT CARBURETTOR

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PREVENTS NAPHTHALENE DEPOSITS.

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without inviting applications; the other instance being at Galashiels, where the elder member of the family retired.

The "Dundee Courier," which has not, at least of late years, exhibited any tender regard for the fortunes of gas managers, on Tuesday published another statement with reference to the Broughty Ferry Corporation gas-works, in which it was said that they understood that since issuing his report on the gas-works, Mr. Herring had been consulted by the Special Committee in regard to the amount necessary to meet the deficit of over £2000 which had caused so much perturbation of late; and that, as a result, an increase of 5d. per 1000 cubic feet was estimated as sufficient. The existing rate is 2s. 11d, so that, by the Town Council endorsing a recommendation involving an additional 5d., the consumers would not be in so bad a position as was at one time predicted. It is added that the labour-saving appliances introduced by the Manager will, it is anticipated, effect a considerable economy during the present financial year. Now, as it was the Dundee newspapers which were almost entirely responsible for the perturbation in the public mind, and predicted an increase of price to about 4s. per 1000 cubic feet, it is interesting, though it may not be—to use a common expression—refreshing, to find one of them admitting that matters are not so bad as they foreshadowed. Apparently the situation at Broughty Ferry is not so hopeless as certain writers persuaded themselves that it was.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 31.

Sulphate of Ammonia.

The month closes with a very quiet market; and the quotations are £12 7s. 6d. per ton f.o.b. Liverpool and Leith, and £12 5s. per ton f.o.b. Hull. During the week there has been a large inquiry; but buyers' ideas being about 5s. per ton below current prices, only a moderate business has been done. In forward, too, there has been a good inquiry; but here, again, buyers' ideas are below those of makers, so that business from first hands has not resulted, and any orders booked have again been taken speculatively.

Nitrate of Soda.

This is firm at 9s. 9d. for ordinary and 10s. for refined quality.

LONDON, *July* 31.

Tar Products.

The markets remain in about the same position, and there is really very little business doing. As regards pitch, there is not very much demand for delivery this year; but sales are reported for next year at reasonable prices. In benzol, the demand continues good for the purposes of gas enriching; and one or two small sales of 90 per cent. are reported for home consumption. But 50-90 per cent. appears to be neglected. In toluol, there is no business whatever doing; but an offer of 6½d. all over the present year is reported to have been declined by London producers. Business has been done in solvent at 7d. at outports for delivery to the end of the present year; while 8½d. was paid for some special quality—prompt delivery London. In crude carbolic, there is still good business doing at 1s. 6d. for 60's August-September delivery; but crystals are neglected, and there is no business to report. Creosote is rather firmer in both London and the country. Tar continues in very strong demand; and in some instances prices are being paid out of all proportion to the actual value of the article.

The average values during the week were: Tar, 23s. 6d. to 33s. Pitch, London, 55s. to 55s. 6d.; east coast, 53s. to 53s. 6d.; west coast, 51s. to 51s. 6d. Benzol, 90 per cent., 8½d. to 9d.; 50-90 per cent., 7d. Toluol, 6½d. to 7d. Crude naphtha, 2½d. to 3d.; solvent naphtha, 7d. to 8½d.; heavy naphtha, 9d. Creosote, London, 1⅜d. to 1½d.; North, 1¼d. Heavy oils, 2d. to 2½d. Carbolic acid, 60 per cent., 1s. 6d. Refined naphthalene, £5 to £8 10s.; salts, 22s. 6d. to 25s. Anthracene, "A" quality, 1⅜d. to 1⅞d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market is decidedly quiet; and there is very little business to report owing to the holidays. The Beckton nominal price is £12 10s., but probably an offer of £12 7s. 6d. would be accepted for early delivery. In Hull, business has been done at £12 5s. for prompt delivery, and at £12 2s. 6d. for forward; but only to a limited extent. In Leith, makers still ask £12 7s. 6d., and small sales are reported at this price. But, as a rule, consumers will not purchase at present, and are holding off the market believing in lower prices. The market closes very quiet; and, although there are several inquiries, very little business appears to have been done during the past week.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The extreme quietude throughout the coal trade of this district, to which reference has been made in previous reports, and which has brought about a very general restriction of the output to three and four days per week, has apparently necessitated a further stoppage of the pits, which, in many cases, will be closed for three days in connection with the August Bank Holiday. The almost invariable report throughout the trade is that business has not been so slack as it is at present for a great many years past. It is not only that house-fire coals, as is usual this time of the year, meet with little or no inquiry, but other descriptions of round coal which go into consumption for iron-making, steam, and general manufacturing purposes are in exceptionally slow demand. The situation would seem to be that, in addition to a restriction of usual requirements, users of fuel are looking forward to possibly lower prices, and are just now buying as sparingly as possible, and for the most part covering their requirements with special hand-to-mouth lots, which are to be bought for prompt delivery at low prices. On the other hand, coalowners are anticipating that, when the summer season has been fairly got through, there may be a

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strengthening of the market, which will enable them to get better prices than are just now ruling on clearance sales for immediate delivery. As a result, there is simply a hand to-mouth, dragging sort of business passing through, which no doubt tends to emphasize the otherwise generally unsatisfactory condition of trade. In fact, the only contracts of importance that have been settled of late have been in connection with requirements for gas-making purposes; and these, as reported last week, are now practically concluded so far as the largest users are concerned. With regard to common round coals for steam and forge purposes, prices remain weak and somewhat irregular, according to the character of the business put through. On prompt sales, common steam and forge coals are to be bought at from 7s. 6d. to 8s. per ton at the pit, with ordinary quotations for the better qualities about 8s. 6d. to 8s. 9d. On sales for shipment, there are some very low-cut quotations to effect special clearances, 8s. 6d. to 8s. 9d. being still reported as figures at which job lots can be bought, with the average quotations of collieries for ordinary descriptions of steam coal about 9s. 6d. up to 10s. delivered at the ports on the Mersey. With the restricted demand for round coals, there is a lessened production of slack; and in the Lancashire district there are no large surplus supplies. The better sorts of engine fuel are not at all over plentiful; but inferior sorts are somewhat of a drug, owing to large quantities of common slack offering from outside districts, especially Derbyshire and Yorkshire. Best Lancashire slacks remain steady at about 6s. 3d. and 6s. 6d. to 6s. 9d. per ton at the pit, good medium sorts 5s. 6d. to 5s. 9d, with common slacks to be bought from 3s. 9d. to 4s. 3d. and 4s. 6d.

Northern Coal Trade.

There is a steady demand for coal; and some of the best of the northern collieries have now well-filled order books, so that there is the probability of a continuance of the activity. In steam coal, the exports are heavy, and there is some pressure for early delivery; so that the prices of the best kinds are very firm at present. Best Northumbrian steam coals are from 10s. 9d. to 11s. per ton f.o.b.; second-class steams are 9s. to 9s. 3d., and steam smalls 5s. 6d. to 5s. 8d. In the gas coal trade, there is a full demand for this season, both for export and for Home consumption. The price may be said to be a little higher for the best kinds, ranging in value according to quality from 8s. 6d. to 9s. 3d. per ton f.o.b.; while one or two contracts for moderate quantities have been settled at prices that are nearer the first of these figures, if the usual allowance be made for the freight. In coke, the market is steady; and gas coke varies more in price, so the question is rather difficult.

Scotch Coal Trade.

Work having been generally resumed in the collieries, there is a better output, though not by any means full yet. The cessation during holidays enabled stocks to be largely worked off. What effect this will have is not yet apparent; but it can only be of a temporary character, and of small extent. The prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 9d. to 9s. 6d., and splint 9s. The shipments for the week amounted to 159,191 tons—a decrease of 74,116 tons upon the previous week, but an increase of 9625 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 5,870,692 tons—an increase of 106,521 tons upon the same period of last year.

The Quality of Gosport Water.—In the House of Commons on Thursday, Mr. Arthur Lee (Fareham) asked the Secretary to the Admiralty whether, in view of the fact that the Gosport water supply had been condemned as unfit for domestic use, and on that account forbidden to be used as formerly on board His Majesty's ships, he would state what steps were being taken to procure a proper supply for the naval establishments situated in the Gosport district, including the barracks occupied by the Gosport Division of the Royal Marines. Mr. Arnold-Forster replied that the Admiralty had for some time been pressing the Local Authority (the Gosport and Alverstoke Urban District Council) to take action in the matter. The Council had appointed a Special Committee to deal with it; and it was understood that action would be taken, if necessary, under the Public Health Act of 1875. It was thought desirable to await the result of these proceedings before considering the advisability of taking independent action.

Street Watering Stopped in Constantinople.—According to a communication made through Reuter's Agency to the "Daily Chronicle," the service of watering the streets of Constantinople has been stopped, owing to a dispute between the Water Company (a French enterprise) and the Municipal Council; and for about three weeks the public thoroughfares have not been watered. The result may well be imagined. It appears that the Municipality have fallen into arrears with their annual payments (£T2500 per annum); and the Company have stopped the supply. The affair has been submitted to the Sultan, and His Majesty has ordered the appointment of a Commission of engineers to consider the question of tapping the springs in the environs of the city, so as to render the Municipality independent of the Company. But as the realization of this scheme would require at least a year, the citizens will have to put up with the present inconvenience until the autumn rains afford relief, or bring the Municipality to a sense of their duty.

The Flow of the Thames at Teddington.—Reference was made in the article on "Water Affairs" last week to the increased flow of water in the Thames as the result of the rainy weather. Some idea of the remarkable volume of water which fell during the three months ended the 30th of June may be obtained from the figures in the records of the Thames Conservancy showing the daily flow of the river at Teddington during that period. The total volume which passed over the weir in April was 32,466 million gallons; the highest flow being 2369 million gallons on the 30th. In May the total was twice as great —71,033 million gallons for the month, with a highest flow of 4304 million gallons on the 7th. The highest figures were reached in June, when the total volume was 97,795 million gallons; the flow on the 21st., as mentioned last week, reaching the remarkable figure of 7174 million gallons. The average daily flow in million gallons for the months of April, May, and June in the last three years was as follows: (1901) April 1887, May 745, June 304; (1902) April 631, May 433, June 745; (1903) April 1082, May 2291, June 3260. The average for June for the last twenty years is 543 million gallons; so the flow for that month this year has been six times as great.

Tenders for the issue of 800 ordinary shares of the East Surrey Water Company, recently invited in our advertisement columns, were opened last Tuesday, and amounted to 2540 shares at prices varying from the minimum of £16 per share to £17 10s. The average price per share obtained for the issue is £16 10s., and no allotment was made under £16 7s. 6d.

The Metropolitan Gas Company of Melbourne, Australia, announce that their profits for the half year to June 30 were £46,750. A dividend of 4s. 6d. per share has been declared for the half year; a sum of £15,000 has been added to the reserve fund; and the balance carried forward is £4750. Dividends were payable in Melbourne yesterday; and drafts to absentee shareholders are to be posted by the first outgoing mail.

An example of the way in which the rates go up was furnished at the meeting of the Great Eastern Railway Company last week. In the six months reported upon, there was an advance of £8092, which came upon an increase of £9732 in the corresponding period of 1902. The Chairman (Lord Claud Hamilton) stated that the Company's land agent had informed him that they might look in the future for an average growth year by year of £17,000.

The formal opening of a new reservoir at Cwmlliedi, near Llanelly, took place last Saturday week. The reservoir has been constructed by Mr. Louis P. Nott, and has a storage capacity of 200 million gallons—the same as the old reservoir, which it adjoins. The entire cost has been about £40,000. Mr. W. Wilkins, J.P., Chairman of the Urban District Council, officiated at the opening, after which Mr. Nott entertained the members of the Council and other invited guests at luncheon.

The Paris correspondent of the "Daily Express" says there is living at No. 21, Rue Montargueil, in that city, a man named Duval, who has just completed his 100th year. He is stated to be the oldest servant in the employ of the Paris Gas Company. In 1823, he was rejected as being unfit for military service, and later he was told by the doctors that he could only live by moving to a warmer climate. He has remained in Paris all his life. He is very active, lives alone, and does his own housework.

Under the title of Gas Patents Syndicate, Limited, a Company has been registered with a capital of £25,000, in £1 shares, to acquire the foreign and colonial rights (except for Portugal, Spain, and Spanish-speaking countries) in an invention known as the dynamic gas producer, to adopt an agreement between Messrs. T. C. Ward and J. Bassett (for the Syndicate); and to turn the invention to account. An illustrated description of the producer was given in the "Journal" for April 7 last (p. 29). There will be no initial public issue.

The Geneva correspondent of the "Daily Chronicle" states that the New Zealand Government intend to make use of a powerful waterfall called the Huka Falls, in North Island, for the purpose of obtaining electricity. A Swiss engineer has been engaged by the Colonial Government to construct an electric station on the falls, and has already left for New Zealand. It is estimated that the electric force which will be obtained will be sufficient to light the principal centres in North Island and to supply power for the tramway systems. The engineer referred to is a well-known authority on the question. It will take a year to complete the new works.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT-MANAGER. Colne Gas Department. Aug. 18.
DRAUGHTSMAN. Jenkins and Co., Retford.
FITTER AND SMITH. No. 4072.
GAS AND WATER MANAGER. Barnoldswick Urban District Council. Aug. 12.
PRODUCER GAS EXPERT. South Staffordshire Mond Gas Company.
SUPERINTENDENT (Gas and Chemical Works). Sheffield Gas Company.
WORKING FOREMAN. Stratford-on-Avon Gas-Works.

Situations Wanted.

LECTURER ON GAS COOKING, &c. Madame Alting-Mees, London.

Meetings of Companies.

BROMLEY GAS COMPANY. Aug. 11.
COMMERCIAL GAS COMPANY. Aug. 20.
CRYSTAL PALACE DISTRICT GAS COMPANY. Aug. 14.
TOTTENHAM AND EDMONTON GAS COMPANY. Aug. 22.

Stock Wanted in Cromer Gas Company.

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TENDERS FOR

Coal and Cannel.

SHEFFIELD GAS COMPANY. Tenders by Aug. 10.

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BRIDLINGTON GAS COMPANY. (Spent).
DEVONPORT GAS DEPARTMENT. Tenders by Aug 29.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Aug. 15.

Pipes and Pipe Laying.

DEVONPORT GAS DEPARTMENT. Tenders by Aug. 29.

Valves, &c.

DEVONPORT GAS DEPARTMENT. Tenders by Aug. 29.

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For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

SULPHURIC ACID for Sale.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS

PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

PRODUCER GAS.

WANTED, an Expert in the application of Producer Gas to Industrial (heating) Operations, to conduct Experiments, and Advise Customers in its use.
Apply, by letter, stating Age, Experience, Salary, and References, to the SOUTH STAFFORDSHIRE MOND GAS COMPANY, Trindle House, DUDLEY.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd.
(Eerste Hollandsche Yzererts Maaty),
ROTTERDAM.
General Manager for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

MADAME ALTING-MEES, Diplomée Paris, Londres, Bruxelles, "LECTURER ON GAS COOKING," is now booking dates for Lectures on the Continent and at home. Would accept a suitable permanent post as Demonstrator.
Write for terms for Lectures and Price of Pamphlet, "La Cuisine au Gaz," to Madame ALTING-MEES, 102, Sinclair Road, Kensington, LONDON, W.

WANTED, a Good Draughtsman. One with experience in Gas-Works Coal and Coke Handling Plant preferred.
Apply, by letter, stating Salary desired, to W. J. JENKINS AND CO., LIMITED, RETFORD.

FITTER and Smith Wanted, used to the Routine of a Gas-Works. A qualified Mechanic preferred.
Apply, by letter, stating all Particulars as to previous and present Employments, Age, and Wages required, to No. 4072, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BARNOLDSWICK URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE above Council invite Applications for the position of GAS AND WATER MANAGER. Applicants to state their Salary, and forward not less than Three recent Testimonials. The successful Applicant will be required to give a Fidelity Bond of not less than £300.
Applications to be sent to the Chairman, Gas and Water Committee, Town Hall, Barnoldswick, not later than Six p.m. on the 12th of August, 1903, endorsed "Gas and Water Manager."

CHAS. THORNTON,
Clerk.
Barnoldswick Urban District Council.

BOROUGH OF COLNE.
(GAS DEPARTMENT.)

ASSISTANT-MANAGER.

THE Gas Committee invite Applications for the position of ASSISTANT GAS MANAGER.
Salary, £100 per annum.
Any person wishing to apply may obtain a List of the Duties from the undersigned.
Applications, stating Age and Experience, and enclosing *copies* of not more than Three recent Testimonials (which will not be returned), must be addressed to the Chairman of the Gas Committee, endorsed "Assistant," and delivered at the Gas-Works not later than Noon on Tuesday, Aug. 18, 1903.

FRED THORPE,
Engineer and Manager.
Gas-Works, Colne (Lancs.),
July 30, 1903.

COAL GAS TAR wanted.

Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and mak Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL.
5, CROOKED LANE, LONDON, E.C.

STRATFORD-UPON-AVON CORPORATION.
(GAS DEPARTMENT.)

WANTED by the above, a Working FOREMAN with a good knowledge of the routine of a Gas-Works making about 60 Millions. To an active young man, the above offers a favourable opportunity of improving his position. A total abstainer preferred.
Wages to commence at 35s. per week.
Apply, with recent Testimonials and References, to

J. S. CRANMER,
Manager.
July 25, 1903.

SHEFFIELD UNITED GASLIGHT COMPANY.

THE Directors of this Company require a SUPERINTENDENT for their Grimesthorpe Gas and Chemical Works.
The present maximum make of Gas is 5 million cubic feet per day; Sulphate of Ammonia, about 3000 tons per annum; and Sulphuric Acid, about 2500 tons per per annum.
Salary £300 per annum, with House, rent free.
Applications, marked "Superintendent," stating Age and previous Engagements, to be made by letter only, addressed to the undersigned, not later than Monday, Aug. 10, 1903.
Testimonials not to be sent till asked for.

HANBURY THOMAS,
General Manager and Secretary.
Gas Offices, Commercial Street,
Sheffield, July 18, 1903.

CROMER GAS STOCK.

WANTED to Purchase a Small Amount.
Full Particulars and Price to No. 4071, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Gas Carbon, in Four Ton Lots or more, f.o.r. Must be Clean and Hard Lumps.
Address No. 4044, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD—Purifiers, Two or Four, 10 feet square by 4 ft. 6 in. deep, planed Joints, Connections, and Overhead Girders.
Write J. WRIGHT, 181, QUEEN VICTORIA STREET, E.C.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices
Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

SPENT OXIDE.

FOR Sale, about 100 Tons of used Bog ORE, fully charged with Sulphur and Cyanogen. Can be delivered on the North-Eastern Railway at this station.
Apply to

J. C. ARCHER,
Secretary.
Bridlington Gas Company,
Aug. 1, 1903.

DEVONPORT GAS-WORKS.
CONTRACT No. 6.

GASHOLDER TANK.

THE Corporation of Devonport are pre-pared to receive TENDERS for the construction of a GASHOLDER TANK at their Works.

Copies of the Specification and Drawings can be seen, on and after Wednesday, the 29th of July, 1903, at the Manager's Office, Gas-Works, Devonport, or at the Office of the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster.

Copies of the Tender and Bill of Quantities can be obtained from the above-mentioned on payment of One Guinea, which will be returned on receipt of a *bona-fide* Tender.

The Corporation do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, in accordance with the instructions at the head of the Tender, are to be delivered to the undersigned not later than Saturday, the 29th day of August, 1903.

SIDNEY E. STEVENSON,
Engineer and Manager.

Gas-Works, Devonport.

DEVONPORT GAS-WORKS.
CONTRACT No. 7.

TELESCOPIC GASHOLDER AND APPENDAGES.

THE Corporation of Devonport are pre-pared to receive TENDERS for the Construction and Erection of a TELESCOPIC GASHOLDER and APPENDAGES at their Works.

Copies of the Specification and the Drawings can be seen, on and after Wednesday, the 22nd day of July, 1903, at the Manager's Office, Gas Works, Devonport, or at the Office of the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster.

Copies of the Tender and Bill of Quantities can be obtained from the above-mentioned on payment of One Guinea, which will be returned upon receipt of a *bona-fide* Tender.

Should intending Contractors so desire, they can obtain copies of the Drawings upon payment of Two Guineas by applying to the Engineers.

The Corporation do not bind themselves to accept the lowest or any other Tender.

Sealed Tenders, endorsed in accordance with the instructions at the head of the Tender, to be delivered to the Deputy Town Clerk, Devonport, not later than Saturday, the 29th day of August, 1903.

SIDNEY E. STEVENSON,
Engineer and Manager.

Gas-Works, Devonport.

DEVONPORT GAS-WORKS.
CONTRACT No. 8.

THE Corporation of Devonport are pre-pared to receive TENDERS for the supplying and laying of CAST-IRON MAIN PIPES, VALVES, and APPENDAGES at their Works.

Copies of the Drawings can be seen on and after Wednesday, the 5th of August, 1903, at the Gas-Works Offices, Devonport, or at the Office of the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster.

Copies of the Specification, with Tender and Schedule of Quantities attached, can be obtained from the above-mentioned on payment of One Guinea, which will be returned on receipt of a *bona-fide* Tender.

The Corporation do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, in accordance with the Instructions at the head of the Tender, are to be delivered to the Town Clerk, Devonport, not later than Saturday, the 29th of August, 1903.

(Signed) SIDNEY E. STEVENSON,
Engineer and Manager.

Gas-Works, Devonport.

DEVONPORT GAS-WORKS.
OXIDE OF IRON.

THE Corporation of Devonport are pre-pared to receive TENDERS for the supply of 250 Tons of IRISH BOG ORE for Gas Purification.

Copies of Specification and Form of Tender can be obtained on application to the undersigned.

The Corporation do not bind themselves to accept the lowest or any Tender.

Sealed Tenders are to be sent in to the Town Clerk, Devonport, not later than the 29th of August, 1903.

SIDNEY E. STEVENSON,
Engineer and Manager.

Gas-Works, Devonport.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

THE Commissioners are prepared to receive QUOTATIONS for the immediate supply of about 350/500 Tons of OXIDE OF IRON suitable for Gas-Works purposes, delivery *ex*-Ship into Commissioners' Waggons at the Granton Harbour free of all charges, or in Railway Company's Waggons, delivered to the Gas-Works Sidings, Granton, North British or Caledonian Railways.

The Contractor will be required to furnish the Engineer with the fullest Information as regards the Material to be supplied, such as the source of its production, as well as the percentage of moisture and effective Ferric-Hydrate in the mass.

The Material is to be delivered at the Granton Works before the 30th of September, 1903.

Further Information may be obtained upon application to Mr. W. R. Herring, Chief Engineer and Manager, Gas-Works, New Street, Edinburgh.

Tenders to be lodged with the undersigned on or before Ten a.m. on Saturday, the 15th of August, 1903.

The Commissioners do not bind themselves to accept the lowest or any Offer.

(Signed) JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh,
July 27, 1903.

IRISH
ASSOCIATION of GAS MANAGERS.

THE

ANNUAL MEETING

Of the Association

WILL BE HELD IN THE

Council Chamber, Town Hall,
WATERFORD,

ON TUESDAY, AUG. 11, 1903.

The Chair to be taken at 11 a.m. by the President, Mr. J. G. TOOMS, Waterford.

Business: Payment of Subscriptions; Report of Committee; Admission of New Members; Election of Office Bearers; President's Address; Reading of Papers, &c.

LIST OF PAPERS TO BE READ.

1. "Gaseous Firing at the Waterford Gas-Works." By Mr. R. BRUCE ANDERSON, Assoc.M.Inst.C.E., London.
2. "Progress of Regenerative Firing since 1880." By Mr. W. DUNN, Queenstown.
3. "Unaccounted-for Gas." By Mr. JOHN PATERSON, Tipperary.
4. LECTURE:—"Some further Experiments on Carbon Monoxide." By Professor C. R. C. TICHBORNE, LL.D., Gas Examiner, Board of Trade, Diplomate in Public Health, Dublin.

On the Invitation of the Directors of the Waterford Gas Company, the Members will dine together at 6.45 p.m., at the Imperial Hotel.

JAMES WHIMSTER,
Hon. Secretary.

Gas-Works, Armagh,
July 23, 1903.

TENDERS FOR COAL AND CANNEL.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for GAS COAL, NUTS, and CANNEL for delivery during the period ending June 30, 1904; the Tenders to state whether the Coal is screened or unscreened.

Tenders (Form for which can be obtained on application) must be delivered to the undersigned not later than the first post on Monday, the 10th day of August.

The Directors reserve the right to take the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street,
Sheffield, July 25, 1903.

COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given, that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 20th of August, 1903, at Twelve o'clock at noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June, 1903, and to declare a Dividend.

The STOCK TRANSFER BOOKS WILL BE CLOSED from the 7th to the 20th of August next, both days inclusive, and the Dividends will be paid on the 3rd of September next to the holders of Stock registered at the date of the closing.

By order of the Board,
H. D. ELLIS,
Secretary.

Offices: Stepney,
July 30, 1903.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 14th day of August, 1903, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend for the same period, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 31st day of July until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
July 28, 1903.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Chief Offices, 639, High Road, Tottenham, on Saturday, the 22nd day of August next, at 2.30 o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June, 1903, to declare a Dividend for the same period, to elect two Directors and an Auditor for the ensuing year, and for the transaction of General Business.

The TRANSFER BOOKS WILL BE CLOSED for the CONSOLIDATED STOCKS from the 8th to the 24th day of August, both days inclusive.

By order of the Board,
JAMES RANDALL,
Secretary.

639, High Road, Tottenham,
July 31, 1903.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the "Bell" Hotel, Bromley, Kent, on Tuesday, the 11th day of August, 1903, at Six o'clock p.m. precisely, to receive the Report of the Directors, the Balance-Sheet certified by the Auditors, to declare a Dividend, and to transact generally the business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 25th of July to the 11th of August, 1903, both days inclusive.

By order of the Board.
HENRY W. AMOS,
Secretary.

Offices: 156, High Street,
Bromley, Kent, July 25, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES 18, FINSBURY CIRCUS, E.C.

Now Ready, Price 2s., Bound in Cloth.

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CALORIMETRY
OF
Producer and Illuminating Gases, with Special Reference to Future Legislation.

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WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER,
Gas Engineers' Agents and Contractors for METERS, FIRE-CLAY GOODS, OXIDE OF IRON, AND ALL OTHER GAS APPARATUS.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

THE
PETROLEUM GAS SYNDICATE
Supply and erect Complete Installations of their
PETROGENE PATENT GAS PLANT
On SALE, HIRE, or ROYALTY.

PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.

The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.

Offices: **28, Victoria St., Westminster.**
Works: **10, Rochester Row, S.W.**

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

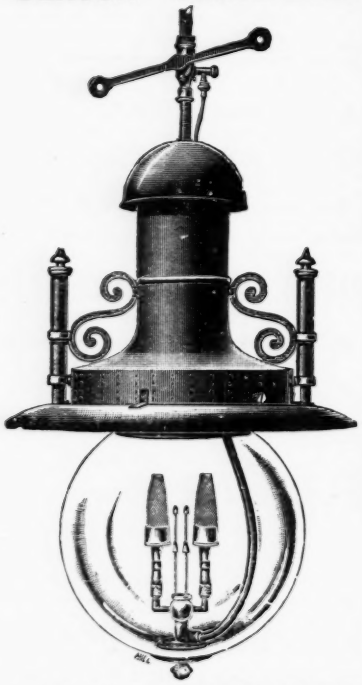
LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS.
Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

48, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

Asbestos
When next in want of
CYLINDER OIL,
order just One Barrel of our
ASBESTOCYLIN XXXXX, XXXX, OR XXX.
You will certainly continue to use it. Approved by Hundreds of Users. Ask for No. 6 Catalogue.
Applications for Colonial & Foreign Agencies invited.
CRESSWELL'S ASBESTOS CO., LTD.,
Wellington Mills, BRADFORD, Yorks.
Telephone 950. Telegrams: "Asbestos, Bradford."

THE PATENT
"BEACON" GLOBE LAMP.



Largely adopted by many Local Authorities for Public Lighting, being absolutely Shadowless and Wind-proof.

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Surrey Engineering Works,
Blackfriars Road, LONDON.
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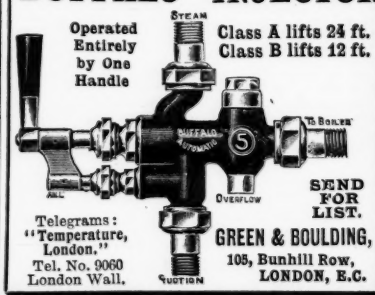
JOHN HALL & CO.,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

THE
"ROTARY"
STATION METER.
Efficiency Demonstrated.
APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

'BUFFALO' INJECTOR



Operated Entirely by One Handle
Class A lifts 24 ft.
Class B lifts 12 ft.
SEND FOR LIST.
Telegrams: "Temperature, London." Tel. No. 9060 London Wall.
GREEN & BOULDING,
105, Bunhill Row, LONDON, E.C.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
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FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
Also Removal of last Traces of
SULPHURETTED HYDROGEN
in catch position.
Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY
RAVENSTHORPE, NEAR DEWSBURY.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR CO., LD.,
CHESTERFIELD.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

THE "MENIER"
AUTOMATIC LIGHTER.
7000 in Use in Brussels.
12,000 in France and Belgium.

Patented in England, Germany, &c.
For description, see "JOURNAL" No. 2086, page 295.
LANTERNS in Cast Iron and Copper for Incandescent Gas Lighting.
Cie. Belge pour la Fabrication des Compteurs et Matériel Gaz, Eau, Electricité,
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For Catalogues and Particulars, apply to
Agents: WILH. LÜTTGE, Ltd.,
4, Cullum Street, London, E.C.

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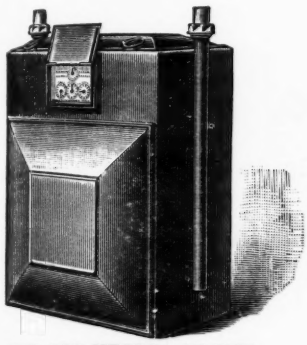

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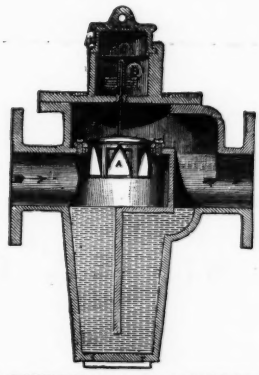

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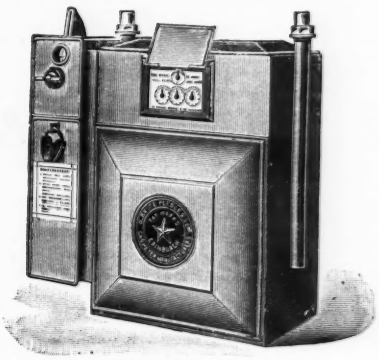

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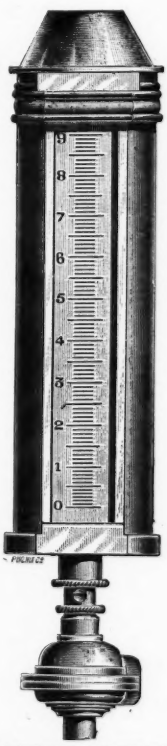

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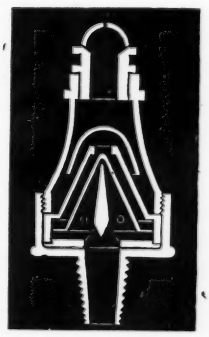

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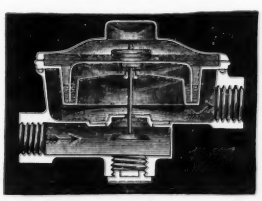

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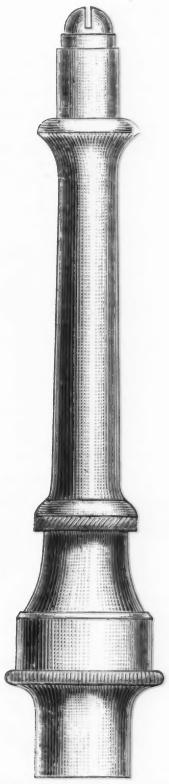

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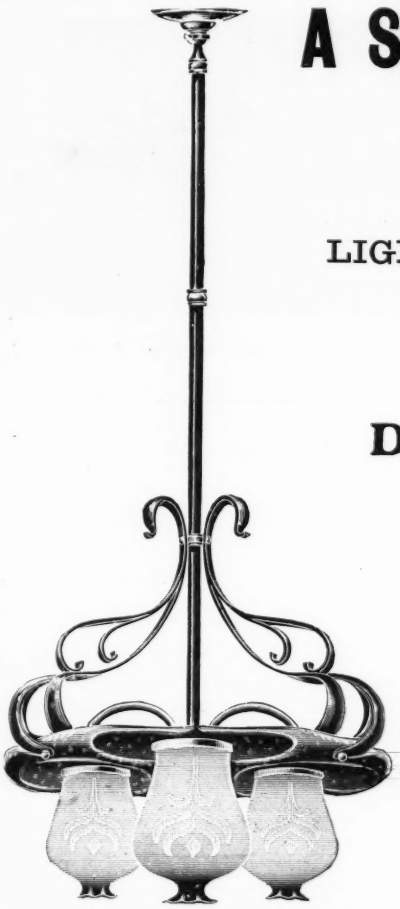

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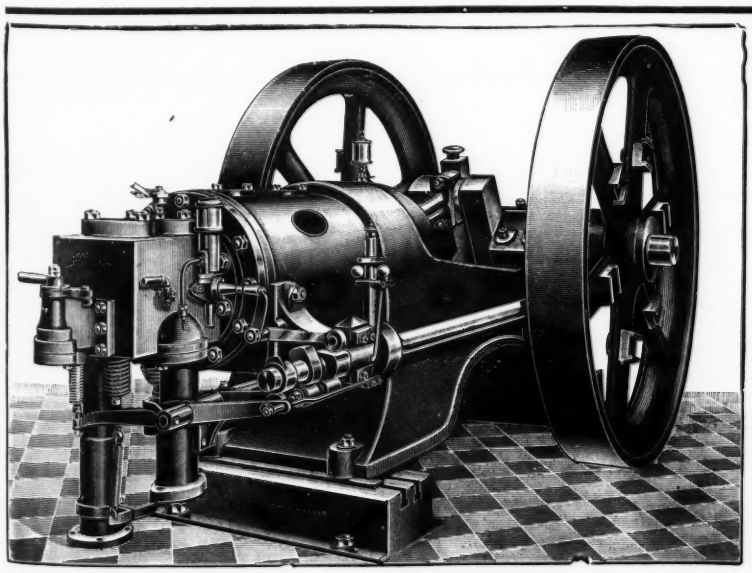

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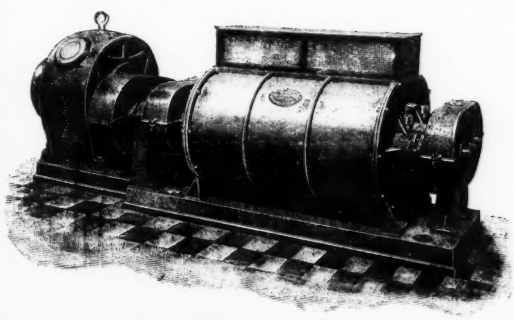

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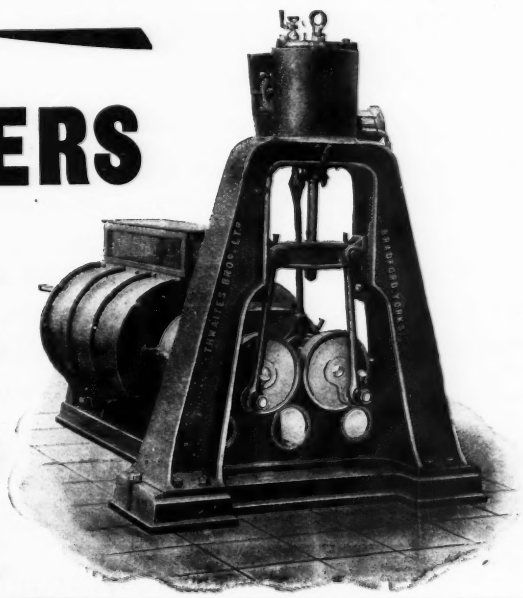

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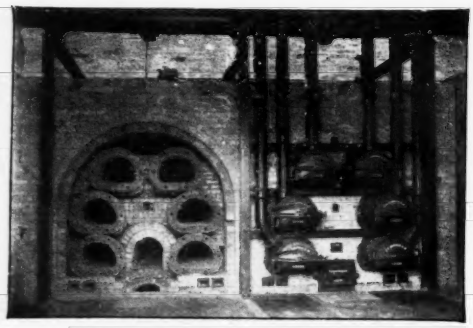

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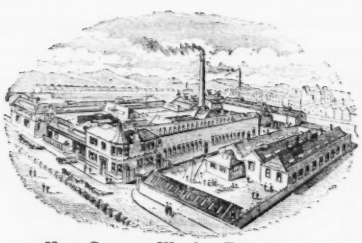

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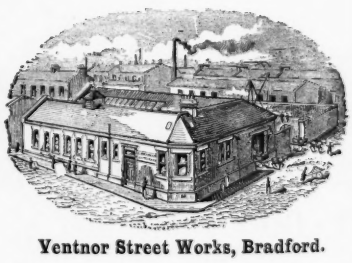

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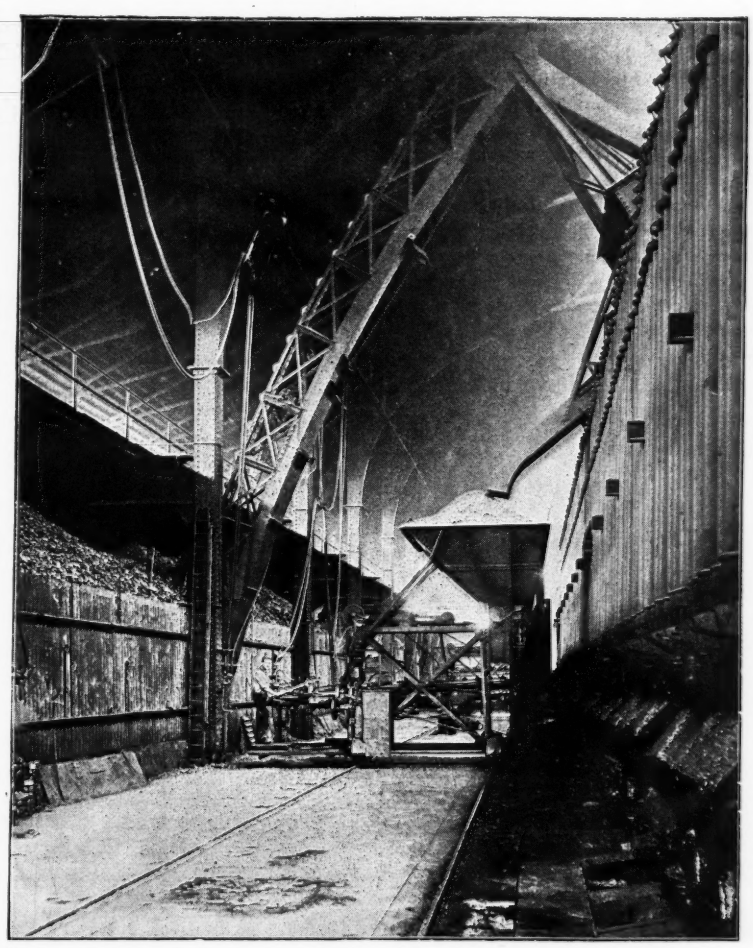

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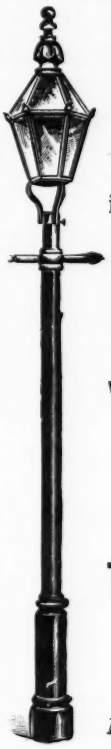

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